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Innovative Methods to Treat Polluted Materials from Used Bioretention Filters for Purification of Polluted Stormwater

Master's thesis in Infrastructure and Environmental Engineering

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Master's Thesis 2026: ACEX 60
Department of Architecture and Civil Engineering
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Gothenburg, Sweden 2026

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Abstract

Urbanization reduces surface areas for natural infiltration and increases the transport of pollutants such as metals, microplastics, and organic pollutants in stormwater runoff. Bioretention filters are widely implemented as green infrastructure for stormwater treatment and have demonstrated high pollutant removal efficiency. Limited knowledge exists regarding the accumulation, distribution, and long-term fate of pollutants within filters, as well as the management of used filter materials after operation. The aim of this thesis was to investigate the distribution and characteristics of metals and microplastics in used bioretention filters and to evaluate potential treatment strategies for microplastics removal and metal recovery.

Two pilot-scale bioretention filters with different sorption materials as a main layer were studied: one containing municipal incineration bottom ash, and another containing biochar. Metals and microplastics contents were analyzed at different depths and filter material layers. Sieving was conducted to evaluate metal distribution in different particle size fractions, while sequential extraction was used to assess metal mobility in polluted materials. Density separation was investigated for removal of microplastics, and acid leaching was evaluated for recovery of metals. Different treatment sequences combining these methods were assessed.

The results showed that metals originating from stormwater accumulated in the surface layer of the biochar-based filter, while elevated metal contents were observed throughout the filter profile in the ash-based filter due to the contribution of metals from the ash materials themselves. Although the finest particle fraction contained the highest metal contents, most of the total metal load was associated with larger particles. Sequential extraction indicated relatively high mobility of Cd and Zn, while Cr and Ni were stable. Microplastics and rubber-related polymers were quantified in both filters, with rubber particles largely retained in the surface layer. No consistent depth-dependent trend was observed for microplastics. Density separation could partially remove certain polymers from the filter materials but showed limited ability to remove rubber particles. Acid leaching combined with density separation achieved the highest metal recovery performance and showed potential as a combined treatment strategy. The results suggest that different management strategies may be required for organic and inorganic materials. Further research is needed to assess the technical, environmental, and economic feasibility of the proposed treatment pathways.

Keywords: bioretention filters, stormwater treatment, trace metals, microplastics, metal recovery

Acknowledgements

I would like to express my sincere gratitude to my supervisors, Glenn and Karin, for their support throughout the past year. Their guidance, encouragement, and dedication to refining every detail of this thesis have been invaluable. Working with them has been an enriching experience and I have learned far more than can be reflected in these pages alone.

My sincere thanks also go to my examiner, Ann-Margret, for her time, thoughtful feedback, and insightful comments throughout the project.

I am also grateful to Amir for all the help in the lab and for making the experiments run smoothly.

Finally, I would like to thank my mother and my sister. Their love and constant support have carried me throughout this journey. I feel incredibly lucky to have my sister in my life, and I will always be grateful for everything they have done for me.

Shiyu Chen, Gothenburg, June 2026

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1 Introduction

Half of the global population currently lives in cities, and the proportion is expected to reach 70% by 2050 (United Nations, 2025). Due to the rapid urbanization, impervious surfaces such as highways, roofs, and pavements replace the natural landscapes, making stormwater infiltration increasingly limited and unnatural (Salerno et al., 2018; Shuster et al., 2005). Pollutants accumulate on these surfaces, and sediments, chemicals, bacteria, viruses and emerging contaminants (e.g. persistent organic pollutants (OP), metals, and microplastics (MPs)) are transported into receiving water bodies, causing water quality degradation (Salerno et al., 2018; Yang, Li, et al., 2021; Singh et al., 2024). The loss of open green spaces undermines climate resilience. At the same time, climate change increases the frequency and intensity of extreme rainfall events, further worsening the vulnerabilities (Liu et al., 2022; Xu et al., 2023). To mitigate and adapt to the combined challenges of urbanization and climate change, many countries have implemented nature-based solutions, such as green infrastructure (GI), also referred to blue-green infrastructure, low impact development (LID) and best management practice (BMP) (Beryani et al., 2021; Green et al., 2021; Li et al., 2019; Sharma & Malaviya, 2021).

Green roofs, rain gardens, and constructed wetlands are typical examples of GI (Chatzimentor et al., 2020). Among these, bioretention systems are one of the most widely used and effective forms. They offer multiple co-benefits, including reducing urban runoff volume, removing pollutants, enhancing landscape quality, improving biodiversity and air quality, reducing noise, and mitigating urban heat island effects (Nieuwenhuijsen, 2021). Bioretention systems have been widely applied and adapted to local conditions, and numerous studies, conducted at both laboratory and field scales, have demonstrated their effectiveness in removing a wide range of pollutants from urban runoff, including MPs, metals, and OPs (Biswal et al., 2022; Johansson et al., 2024; Lange et al., 2021). These conclusions are commonly drawn based on comparisons between influent and effluent water quality, providing limited insight into the internal behaviors of pollutants within the system. In particular, the retention, migration, and spatial distributions of pollutants across different layers remain insufficiently understood. By sampling soils from operated bioretention systems, previous studies have shown that pollutants tend to accumulate in the upper layers (Gilbreath et al., 2019; Kluge et al., 2018; Lange et al., 2023). In addition, the accumulation of pollutants raises concerns regarding long-term operation, maintenance, and disposal. Although it is commonly suggested that the filter materials, especially the top layer, require regular replacement, research on the treatment of these spent materials remains limited. For example, limited attention has been given to post-treatment strategies and the potential for resource recovery, despite the possibility that high metal concentrations in used filter materials could be exploited for metal recovery.

1.1 Aims

This thesis aims to improve the understanding of pollutant retention in used bioretention filters and to explore sustainable post-treatment strategies with potential resource recovery. Specifically, this thesis investigates the distribution and characteristics of metals and MPs within different filter layers, evaluates metal mobility and recovery potential using sequential

extraction, and examines post-treatment approaches, including density separation for MPs and acid leaching for metal recovery, as well as their combined application.

The goals are to answer the following research questions:

- How are metals and MPs distributed in depth and in the different filter materials of the bioretention filters, and how do their contents, particle size distributions, and polymer compositions vary?
- How can residual MPs be effectively separated from soil and sorbent material in the used bioretention filter?
- Is it possible to develop a method that effectively separates MPs and, at the same time, recovers valuable metals from soil from the bioretention filter?

2 Background

This chapter provides the background necessary to support the understanding of pollutant behavior in bioretention systems and introduces the characteristics of pollutants commonly found in urban runoff, including MPs, metals, and OPs, as well as relevant degradation and treatment approaches.

A typical bioretention system consists of vegetation planted in a soil bed, filter layers built up by materials such as soil, sand, gravel, and additional sorbent materials, as well as an underdrain system (Davis et al., 2009; Liu et al., 2014; Roy-Poirier et al., 2010). Based on local infrastructures and climates, various design and operation guidelines have been developed. For example, Wang et al. (2017) has shown that design guidelines developed for temperate climates cannot be directly applied to tropical regions. Similar findings have been reported in subtropical regions such as Brazil (de Macedo et al., 2019), in Nordic countries such as Finland (Tahvonen, 2018), and in arid or semi-arid regions such as Utah (Houdeshel et al., 2015).

Bioretention systems located in urban environments receive runoff containing various pollutants, including traffic-related particles, metals, and OPs. These pollutants tend to accumulate within the filter materials over time, with higher pollutant concentrations often observed in the upper layers, while fine particles may migrate to deeper layers (Duan et al., 2024; Furén et al., 2023). Long-term accumulation can compromise system performance by reducing purification efficiency and shortening the system lifespan (R. A. Brown & Hunt, 2012; Chu et al., 2021). The surface layer therefore often requires more frequent replacement (R. A. Brown & Hunt, 2012; Gilbreath et al., 2019). The excavated filter materials may contain high pollutant concentrations and, in some cases, be classified as hazardous waste and must be handled accordingly (Al-Ameri et al., 2018; Furén et al., 2023). Different sorbent materials such as biochar, coconut coir, peat, pumice, and compost have recently been employed in many studies due to their strong sorption capacity (Mohanty et al., 2018; Narayanasamydamodaran et al., 2024; Sagrelus et al., 2023).

A clear understanding of the types, distribution, and behavior of pollutants retained in the filter materials is therefore essential for evaluating their environmental risks, guiding maintenance practices, and informing appropriate post-treatment and management strategies for used filter materials.

2.1 Microplastics

Microplastics are commonly defined as plastic particles smaller than 5 mm (Andrady, 2011). A range of polymer types have been reported in urban runoff, including polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET), and polyvinyl chloride (PVC) (Wang et al., 2022). Potential sources in urban runoff include traffic-related emissions (tire and road wear, road paint, asphalt particles), litter, construction materials, and artificial turf (Birch et al., 2020). Reported concentrations of MPs in urban environment vary widely, ranging from 0 to 8580 particles/L, and regional studies are influenced by local conditions (Wang et al., 2022). For example, in Gothenburg, stormwater has been reported to

contain up to 5,900 particles/L of tyre and bitumen-related MPs ($>20\ \mu\text{m}$) (Järlskog et al., 2020).

Street runoff can transport MPs into adjacent soils, receiving water bodies, and even groundwater (Xiang et al., 2022; Yang, Zhang, et al., 2021). High concentration of tyre wear particles (TWP) has been detected in roadside soils along a Swedish national motorway, and although the concentrations decrease with increasing distance from the road, TWPs remain detectable at location further away (Polukarova et al., 2025). In addition to horizontal transport, MPs can also migrate vertically into deeper soil layer overtime and eventually end up in groundwater (Chia et al., 2021; Panno et al., 2019).

These remaining MPs have a toxic effect on the environment. For example, MPs can consist of polymers with harmful organic and inorganic additives (Groh et al., 2019; Suhrhoff & Scholz-Böttcher, 2016). The harmful chemicals present in MPs have the potential to spread in the soil as MPs migrate in the soil, thus posing ecological and health risk (Guo et al., 2020; Ivar do Sul & Costa, 2014). Also, due to their large specific surface area and strong surface hydrophobicity, MPs can absorb and concentrate on other environmental pollutions including metals and OPs (Li et al., 2020; Liu et al., 2022; Xiang et al., 2022). Consequently, MPs can act as vectors to transfer contaminants to different environmental compartments (Holmes et al., 2012, 2014). These can produce toxic effects on the environment and increase the difficulty of degradation. In addition, MPs can be mistaken by animals such as snails, earthworms, and marine animals, and the damage can be both mechanical (e.g., clogging of the digestive tract) and chemical (e.g., exposure to harmful additives) (Hale et al., 2020).

Functioning bioretention systems located near roads can effectively retain MPs through physical filtration and sedimentation, primarily within the upper layer of the materials (Gilbreath et al., 2019; Lange et al., 2023). However, due to their high stability and resistance to degradation (Chamas et al., 2020; He et al., 2018; Liu et al., 2022), MPs tend to persist and gradually accumulate in the bioretention materials over time. Long-term retention not only alters fundamental properties of soil but also raises concerns regarding their potential toxicity and interaction with co-existing pollutants (Yang, Zhang, et al., 2021).

2.2 Metals

Metals associated with urban runoff mainly include Cd, Cu, Cr, Ni, Pb, and Zn (Järlskog et al., 2022; Müller et al., 2020). These metals are primarily generated from vehicle-related sources, such as tyre wear, brake, engine, and wheel balance weights. Additional contributions include construction activities that often involve heavy vehicles and equipment, as well as urban littering.

In urban runoff, metals occur mainly in particulate form (70–99%) (Lange et al., 2022), and bioretention systems can effectively remove these particulate bound metals through sedimentation and filtration processes (Liu et al., 2025). Dissolved metals are mainly removed through sorption within the biofilter materials (Sun & Davis, 2007), while the removal is often insufficient, particularly for dissolved Cu (Lange et al., 2020). Most retained metals accumulate

in the upper layers of bioretention materials (Al-Ameri et al., 2018; Lucke & Nichols, 2015), and their concentrations may exceed guideline values for ecological and/or human protection (Al-Ameri et al., 2018). In addition, MPs can act as vectors for metals, influencing their transport and environmental fate. Studies have shown that MPs have a strong affinity for metals and can rapidly absorb them (Godoy et al., 2019; Hildebrandt et al., 2021). The co-accumulation of MPs and metals increases the bioavailability of metals in soils. Microplastics may be mistakenly ingested by organisms, and the associated metals can then be released within organisms and enter the food chain (An et al., 2023; Gudeta et al., 2023; Zhou et al., 2019).

Changes in environmental conditions may remobilize these retained metals (Bruemmer et al., 1986; Caporale & Violante, 2016). The mobility of metals in soils is closely related to the chemical forms of metals (Gleyzes et al., 2002). The mobility of metals in soil can be classified into five fractions: exchangeable, carbonate bound, Fe and Mn oxide bound, organic matter bound, and residual, based on a sequential extraction scheme originally developed for sediments (Tessier et al., 1979). The exchangeable fraction represents weakly bound metals that are highly mobile. The carbonate fraction is susceptible to pH decrease; the Fe-Mn oxide fraction is unstable under low redox potential environment; the organic matter bound fraction is subject to degrade under oxidizing condition; while the residual fraction is typically stable under natural conditions (Filgueiras et al., 2002; Kaasalainen & Yli-Halla, 2003; Yutong et al., 2016). The speciation-dependent mobilities suggest that, under changing environmental conditions, these metal-enriched filter materials may become a source of metal leaching and therefore pose potential risks.

Additionally, stormwater often contains dissolved organic matter, which can be expressed as dissolved organic carbon (DOC) (Kalev & Toor, 2020). Many studies reported that DOC can enhance metal mobility, and it has been shown to induce the desorption of metals from both surface and deeper layers of bioretention materials, with Cu often exhibiting the most pronounced response (Al-Amin et al., 2024; Esfandiar & McKenzie, 2022; Johansson et al., 2024).

2.3 Organic Pollutants

This section provides a brief overview of OPs relevant to bioretention systems. Over 1000 specific OPs have been identified in stormwater originating from the road environment, such as polycyclic aromatic hydrocarbons (PAHs), and aliphatic hydrocarbons, phthalates (Polukarova et al., 2020). These pollutants are released from traffic-related activities, such as exhaust gases, fuels, lubricating oils, road construction materials, and vehicle components including tyres, brakes and body materials (Järnskog et al., 2021). Many of these OPs are environmentally persistent, bio-accumulative, and may have detrimental long-term effects (Alharbi et al., 2018; Gaur et al., 2018).

In bioretention systems, OPs are mainly retained through filtration and adsorption, with removal rates of up to 96% (LeFevre et al., 2015; Lucke & Nichols, 2015). As OPs in

stormwater are usually associated with suspended solids, their retention primarily occurs in the surface of filter materials (Furén et al., 2022). Once retained, OPs may undergo degradation and mineralization by microorganisms such as bacteria and fungi within the filter, and/or be taken up by vegetation through root systems. However, many OPs have high persistence and resistance to degradation, allowing them to remain in the environment and be able to travel long distances through water-air-soil systems (Alharbi et al., 2018; Gaur et al., 2018). Similar to metals, OPs, especially hydrophobic OPs, can be absorbed and transferred by MPs (Fu et al., 2021).

To summarize, MPs, metals, and OPs can be effectively retained in bioretention systems, leading to their gradual accumulation within the filter materials over time. Their coexistence may lead to synergistic effects that influence contaminant transport and fate. However, only a limited number of studies have addressed long-term accumulation, co-contamination, and possible leaching of metals in stormwater biofilters. Exploring existing treatment and management approaches for these contaminated materials is therefore important to support their sustainable handling.

2.4 Potential Treatment Approaches for Used Filter Materials

Microplastics and metal can potentially be separated and recovered from the solid materials, whereas OPs are generally removed through degradation rather than physical separation. Microplastics may also be degraded through chemical processes. Different treatment approaches are required depending on the target pollutants, summarized in Table 1.

2.4.1 *Microplastics Separation*

Several methods have been applied to separate MPs from soil matrices, including density separation, filtration, and floatation. Density separation is the most applied technique (Nabi et al., 2022). Density separation isolates MPs based on density differences between MP particles and soil. Generally, soils have a density of 2.7 g/cm³, and MPs range from 0.8 to 1.6 g/cm³. Saturated salt solutions can be used to separate MPs from soil matrices (Löder & Gerdt, 2015). Commonly used salt solutions include sodium chloride (NaCl, 1.2 g/cm³), zinc chloride (ZnCl₂, 1.6 g/cm³), sodium iodide (NaI, 1.8 g/cm³), and zinc bromide (ZnBr₂, 1.7 g/cm³).

High density solutions usually achieve higher recovery rates, particularly high-density polymers (Quinn et al., 2017), but several limitations restrict their application. For example, NaI is expensive, ZnCl₂ is hazardous and corrosive, and ZnBr₂ is both costly and environmentally harmful (Tirkey & Upadhyay, 2021). While NaCl is sufficient for separating low-density MPs, such as polypropylene (PP) and polyethylene (PE), from sandy matrices, with reported recovery rates of up to 90% (Schütze et al., 2022). Due to its effectiveness, low cost, ease of handling, and environmental acceptability (Quinn et al., 2017), NaCl remains the most commonly used solution.

2.4.2 *Degradation of Microplastics and Organic Pollutants*

2.4.2.1 *Conventional degradation techniques*

Conventional degradation methods, including biodegradation, chemical oxidation, and thermal degradation, have been widely explored for removing MPs and/or OPs from contaminated materials, with varying removal efficiencies depending on the contaminant types and treatment conditions.

Biodegradation is a natural process in which microorganisms (e.g., bacteria and fungi) metabolize pollutants or organic matter and transform them into less harmful or non-toxic forms under aerobic or anaerobic conditions (Gaur et al., 2018; Liu et al., 2022). Fungi, either alone or in combination with bacteria, have recently been applied as promising agents in microembolization. Fungi have been reported to remediate combined pollution of PAHs and metals (Li et al., 2020), and they have also shown the ability to degrade certain MPs (Paço et al., 2017; Sangale et al., 2019). However, imitations remain. For MPs, biodegradation is still constrained by the high molecular weight of common polymers (Miri et al., 2022) and the degradation of plastics remains very complex and poorly controlled (Liu et al., 2022; Miri et al., 2022). Its efficiency further depends on the bioavailability of the pollutant and the environmental conditions, such as temperature, oxygen, nutrients, and the presence of toxic substances (A. E. et al., 2020; Ahmed et al., 2018; Sivan, 2011). The biodegradation of MPs and persistent OPs is relatively slow (about 30–60 days), which limits its application at commercial scale (A. et al., 2020; Lü et al., 2024).

Chemical oxidation relies on the strong oxidizing properties of oxidants to degrade OPs. Common oxidants include permanganate, hydrogen peroxide, persulphate, and ozone (Dombrowski et al., 2018; Ranc et al., 2016; Wei et al., 2022). These oxidants can react with pollutants through electron transfer in a conventional redox reaction. When chemical oxidation technology is used to treat soil, intermediate products are sometimes more toxic or less biodegradable than the parent compound (Lemaire et al., 2013; Shi et al., 2023). Another limitation is the non-specific nature of oxidants. In soils with a high organic content, oxidants may be consumed not only by the targeted pollutants but also by organic matter (Lemaire et al., 2013; Rivas, 2006; Wei et al., 2022). This overconsumption reduces treatment efficiency and increases operational costs.

Incineration has been widely applied for the disposal of industrial wastes through thermal degradation at high temperatures (usually 900°C or greater). This process can destroy the organic fraction of the waste and reduce volume (Oppelt, 1987), and incineration of plastics might contribute to energy recovery due to their high calorific value (Kunwar et al., 2016). Soils generally contain relatively low organic contents, meaning that incineration may require additional energy input rather than producing energy, depending on the composition of the materials. However, incineration may generate various pollutants such as sulfur oxides (SO_x), nitrogen oxides (NO_x), and hydrogen chloride (HCl), as well as persistent OPs such as dibenzodioxins and furans (Laine & Cheng, 2007; Zhang et al., 2021). Incineration plants also release greenhouse gas, particularly carbon dioxide (CO₂), which contributes to climate change

(Panepinto et al., 2022). Several studies have suggested that incineration may not completely eliminate MPs. Microplastics have been reported in municipal solid waste incineration ash in studies from different countries, including China (Luo et al., 2024; Shen et al., 2021; Yang et al., 2021), Korea (Hong et al., 2026), and Iran (Valizadeh et al., 2025). Reported MP abundances in bottom ash vary widely, ranging from a few particles per gram or kilogram of ash, and considerable variation exists among these studies. It remains unclear whether the MPs are from incomplete degradation during incineration or are introduced during post-treatment processes such as storage and metal sorting.

2.4.2.2 AOPs

Advanced oxidation processes (AOPs) involve the in-situ formation of highly reactive oxidative species (e.g., $\cdot\text{OH}$, $\text{SO}_4\cdot^-$) and their reactions with target contaminants (Oturán & Aaron, 2014). Due to their strong oxidation capacity, AOPs have been applied for the degradation of persistent organic and inorganic pollutants (Cheng et al., 2016; Kim et al., 2022). Various AOPs have been developed based on different activation mechanisms.

In chemical AOPs, the Fenton process is one of the most established techniques (Oturán & Aaron, 2014). It relies on the reactions between hydrogen peroxides (H_2O_2) and ferrous ions (Fe^{2+}) to generate active oxygen species capable of oxidizing contaminants. Fenton AOPs are inexpensive and simple to operate, but the process requires large amounts of chemicals for wastewater acidification, and subsequent neutralization and purification before disposal (Zhang et al., 2019). Fenton process can be combined with light irradiation (e.g., UV light, sunlight) i.e. photocatalytic AOPs or integrated with electrochemical reactions i.e. electrochemical AOPs to improve the oxidation efficiency.

Photocatalytic AOPs are driven by the generation of highly reactive electron-hole pairs on the surface of photocatalysts under the UV or visible light (Nakata & Fujishima, 2012). Photocatalysis has been applied for the oxidation of various organic compounds such as PCBs and PAHs (Ibhadon & Fitzpatrick, 2013; Zhang et al., 2008), as well as different types of MPs (Uheida et al., 2021). One major limitation is the rapid recombination of photogenerated electrons and holes, which can reduce oxidation efficiency (Zhu & Zhou, 2019).

Electrochemical AOPs (EAOPs) are another important category of AOPs. In EAOPs, hydroxyl radicals can be generated either through electro-assisted catalytic reactions (e.g., electro-Fenton) or via direct anodic oxidation (Sirés et al., 2014). EAOPs offer advantages such as reduced chemical consumption, high pollutant degradation efficiency, and good process controllability (Chaplin, 2014). EAOPs are limited by the costs of electrical supply (Sirés et al., 2014). Also, organic materials may be deposited on the surface of electrode, which will lead to the activity reduction and shortening of electrode lifetime.

Photoelectrocatalysis (PEC) represents a hybrid AOP that combines photocatalysis and electrochemical processes, integrating the advantages of both processes. By applying an external electric current, electron-hole recombination can be reduced, accelerating photocatalytic reaction (Daghrir et al., 2012). It also stands out due to its environmental

sustainability, as PEC can utilize solar energy as a clean and renewable energy source to drive reactions (Yu et al., 2024). This method is well suited for co-contaminated environments, where various OPs, MPs and metals coexist (Liu et al., 2016; Peleyeju & Arotiba, 2018; Zhao et al., 2013). For example, Norén et al. (2025) reported up to 99% degradation of PAHs, PCBs, and TBT, while simultaneously recovering 76% of Cu. Studies have also demonstrated the applicability of PEC in the degradation of MPs, such as high-density PE (Quilumbaquin et al., 2024) and PS nanoplastics (Chen et al., 2023).

Currently, PEC studies are mainly conducted at a laboratory scale using simulated water matrices that are less complex than real wastewater systems or contaminated soil systems. The presence of suspended particles may limit light penetration and reduce treatment efficiency, and the study by Norén et al., 2025 using sediment samples, may not fully represent soil-based systems. In addition, the incorporation of sorbent materials (e.g., biochar) in bioretention systems may further increase the matrix complexity. Challenges such as low energy conversion efficiency and system instability still need to be addressed (Su et al., 2025; Yu et al., 2024). Nevertheless, the ability of PEC to simultaneously degrade OPs, MPs, and recover metals indicates its strong potential as an integrated and sustainable treatment technology. Further research is needed to advance PEC under more realistic conditions and for future industrial applications.

2.4.3 *Metal separation*

In Europe, soil containing hazardous substances is commonly treated by landfill (European Environment Agency, 2023). The landfill cost in the EU is EUR 39–46 per tonne of waste. In Sweden, landfilling further includes a landfill tax of SEK 725 per tonne (approximately EUR 60 per tonne in 2024) (European Environment Agency, 2025). In the context of bioretention systems, excavated filter materials often contain high concentrations of pollutants, including metals, especially in upper layers (Sun & Davis, 2007), MPs (Lange et al., 2023), and OPs (Furén et al., 2023). Although landfilling is simple and time-efficient, it could be costly due to the large volume of contaminated materials and the hazardous components. In addition, landfilling poses several environmental risks, including the generation of biogas and contaminated leachates that may negatively affect surrounding environments (Vaverková, 2019). At the same time, metals accumulated in the filter materials can be considered as potential secondary resources. Metals such as Cu, Zn, Pb and Ni are valuable industrial resources with increasing global demand (Elshkaki et al., 2018; Tominc et al., 2023). Recovering metals from these metal-enriched materials can provide an opportunity to reduce disposal burdens while simultaneously contributing to resource recovery.

Metal recovery methods can be classified into hydrometallurgical and pyrometallurgical methods. The pyrometallurgical method includes smelting, roasting, converting, and refining and relies on high temperatures, which often are associated with high energy consumption, higher operational costs, and metal loss (Jadhav & Hocheng, 2012). In contrast, hydrometallurgical processes are operated under milder conditions and have advantages such as lower energy consumption and reduced environmental impact (reduced gas emission) (Krishnan et al., 2021). Hydrometallurgical processes often include dissolving metals into

solutions, followed by separation and recovery. Pyrometallurgical methods are commonly used to recover valuable metals from electronic waste (Wang et al., 2017), whereas hydrometallurgical methods are preferred for large-volume waste due to their economic advantages and suitability for industrial-scale processing (Gunarathne et al., 2022). Given the large volumes of contaminated bioretention materials, the hydrometallurgical method is selected and further discussed below.

Leaching is the first step and aims to dissolve metals and metal compounds into solutions for subsequent separation and recovery (Sethurajan et al., 2017). It can be classified as chemical leaching or bioleaching depending on the agents used. Bioleaching is considered environmentally friendly; it generally requires longer processing time than chemical leaching, often ranging from days rather than hours, which may limit large-scale application (Funari et al., 2017). Chemical leaching employs chemical agents such as inorganic acid, organic acid, or alkaline liquids to mobilize metals. Among chemical leaching approaches, acid leaching using inorganic acids such as hydrochloric acid (HCl), nitric acid (HNO₃), and sulfuric acid (H₂SO₄), is one of the most widely applied and effective method (Tang & Steenari, 2016; Karlfeldt Fedje et al., 2010).

Following leaching, metal dissolved in the leaching solution can be recovered through separation techniques such as chemical precipitation, solvent extraction, and electrowinning (Sethurajan et al., 2017). Solvent extraction and electrowinning are often applied in commercial hydrometallurgical operations to improve metal recovery efficiency. However, solvents used in solvent extraction may have potential environmental and toxicity concerns, and electrowinning processes could be complexed (El-Nadi, 2017; Sethurajan et al., 2017). Chemical precipitation is a traditional and practical method used on an industrial scale due to its simplicity and cost effectiveness. In this process, dissolved metals are precipitated from metal-enriched solutions to sulfides, hydroxides, or carbonates which can be separated as metal-rich precipitates (Chen et al., 2018). These precipitates can be further refined in the metallurgical process for final metal recovery.

Table 1 Summary of treatment methods based on the literature review and discussion in this chapter

Category	Method		Efficiency	Complexity	Energy/cost	Environmental impact	Scalability
Microplastics and/or organic pollutants	Separation	Density separation	Low	Low	Low	High (salt solution consumption and secondary liquid waste generation)	High
	Conventional degradation	Chemical oxidation	High	Medium	Medium	High (chemical consumption and secondary liquid waste generation)	High
		Thermal degradation (e.g., incineration)	High	Medium	High (energy-intensive; potential for energy recovery via WtE)	Medium (toxic by-products and GHS emissions)	High
		Biodegradation	Low to medium (limited degradation extent and slow process)	Medium	Low	Low	Low (limited to laboratory scale)

Table 1 Continued

Category	Method		Efficiency	Complexity	Energy/cost	Environmental impact	Scalability
Microplastics and/or organic pollutants	AOPs	Chemical AOPs (e.g., Fenton process)	High	Medium	Low	High (chemical consumption and secondary liquid waste generation)	Low (limited laboratory scale)
		Photocatalysis	Medium	High	Medium to high	Low	
		Electrochemical	High	Medium	Medium (electricity demand)	Low	
		Photoelectrocatalysis	High	High	Medium	Low	
Metal-contaminated materials	Physical separation (e.g., sieving)		high (separation efficiency)	Low	Low	High (residual contamination in fine fractions)	High
	Metal recovery	Pyrometallurgy	High	Medium	High (energy-intensive)	Medium (toxic by-products and GHS emissions)	High
		hydrometallurgy	High	Medium	Medium	High (acid consumption and secondary liquid waste generation)	High
General contaminated materials	Landfill		Low	Low	High	Very high (long-term environmental risk)	Very high (widely implemented)

3 Materials and Methodology

3.1 Study Site and Bioretention Filters

The pilot-scale bioretention system investigated in this study is located adjacent to the highly trafficked E6 Highway in Gothenburg, Sweden, and was irrigated with stormwater from the highway and adjacent impervious surfaces for around three years, from May 2022 to March 2025. A detailed description of the system design is provided by Johansson et al. (2024). Briefly, the investigated bioretention filters consisted of a layer structure. The upper layer is sandy loam mixed with pumice stone, followed by the layer containing sandy loam, pumice stone and a sorption material. Beneath that, it is a pure sorption material layer. A fine sand layer and a gravel drainage layer were located below the sorption layer.

The bioretention filter is planted with thrift, sea buckthorn, common rush, and red fescue. These plant species were selected for their tolerance to short period of water saturation, short drought periods, and elevated salinity, as well as their suitability for bioretention systems treating traffic-related runoff (Johansson et al., 2024). All selected species are non-invasive within the local environment. Biochar, sphagnum peat and municipal solid waste incineration bottom ash (MIBA) were used as sorption materials in the bioretention filters. Biochar is characterized by a high specific surface area and a porous structure, providing strong adsorption capacity (Weber & Quicker, 2018), and it can remove various pollutants from runoff in bioretention systems (Biswal et al., 2022). *Sphagnum* peat is effective in removing dissolved metal pollutants (P. A. Brown et al., 2000). Municipal incineration bottom ash (MIBA) is a porous material that can act as a low-cost adsorbent (Silva et al., 2017), and also represents a potential source for metals recovery (Karlfeldt Fedje et al., 2021).

Initial characterization of the filter materials showed that the MIBA used in the filters contained high metal contents, particularly Cu and Zn (Table 3), whereas the biochar showed low metal contents. Evaluated metal contents were therefore expected in the A3 filter due to the presence of MIBA. Previous studies of the bioretention filters showed that Cu and Zn concentrations in the influent stormwater exceeded the Gothenburg guideline values, and decreasing concentrations and high removal rates were observed in the effluent overtime (Johansson et al., 2024). Regarding MPs, the original biochar and MIBA materials were assumed to contain negligible MP contents. The stormwater used for irrigation identified PI and PB as dominant polymer types, followed by PVC, PE, and PP. Although A3 and B3 were not directly examined for MP removal, similar filters with the same design (A1, A4, B1, and B4) showed high MP removal efficiencies, with removal rates reaching 98–100% for most polymers, except for PE and PP (>83%).

Two bioretention filters (A3 and B3) were excavated and investigated in this study based on their high pollutant removal performance. The filter layers had changed during the operation, mainly due to degradation of organic materials, and the resulting sampled layers are presented in Table 2.

Table 2 Original layers (built in 2022) and sampled layers (excavated in 2025) of A3 and B3 filters.

Filter	Before Operation		After Operation	
	Depth (m)	Original Layer	Depth (m)	Sampled Layer
Main layer ash: A3	0–0.15	Sandy loam with pumice stone (Hekla Regnbädd)	0–0.15	Sandy loam with pumice stone (Hekla Regnbädd)
	0.15–0.70	A mixture of 35% Hekla Regnbädd, 50% of MIBA, and 15% compost	0.15–0.35	A mixture of 35% Hekla Regnbädd, 50% of MIBA, and 15% compost
			0.35–0.55	
			0.55–0.75	
	0.70–0.75	Biochar	0.75–0.80	Biochar
	0.75–0.80	Peat	0.80–0.81	Peat
	0.80–1.1	Sand/gravel	0.81–1.1	Sand/gravel
Main Layer biochar: B3	0–0.15	Sandy loam with pumice stone (Hekla Regnbädd)	0–0.15	Sandy loam with pumice stone (Hekla Regnbädd)
	0.15–0.70	A mixture of 60% Hekla Regnbädd, 40% of biochar	0.15–0.30	A mixture of 60% Hekla Regnbädd, 40% of biochar
			0.30–0.45	
			0.45–0.65	
	0.70–0.80	biochar	0.65–0.75	Biochar
	0.80–1.1	Sand/gravel	0.75–1.1	Sand/gravel

3.2 pH and LOI

Samples were first dried at 105 °C for 24 h to remove water content. Subsequently, 3 g of dried material was transferred to a tube and mixed with 30 mL of Milli-Q water, corresponding to a liquid-to-solid ratio of 10:1. The tube was shaken for 10 min and then allowed to settle before measurement. The pH was measured using a pH meter, and one measurement was performed for each sample.

Loss on ignition (LOI) is used to estimate the organic matter contents of the filter materials. An empty aluminum cup was weighed, after which approximately 5 g of dried sample was added, and the total mass was recorded. The samples were then heated in a furnace at 550 °C for 30 min. After cooling to room temperature, the cups were weighed. One measurement was

performed for each sample. The LOI was calculated as the percentage mass loss during ignition according to the following equation:

$$LOI (\%) = \frac{\text{Initial dry weight} - \text{Ignited weight}}{\text{Initial dry weight}} \times 100$$

3.3 Metal Contents and Particle Size Distribution

Metal contents in the used filter materials were analyzed by an external laboratory using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) according to SS-EN ISO 17294-2:2023 and US EPA Method 200.8:1994. Samples were collected from different filter layers (A3 0–0.80 m and B3 0–0.75 m), and each sample was analyzed in triplicate.

To understand metal distribution between particle sizes, dry sieving was performed on the total 11 layers (A3 0–0.80 m and B3 0–0.75 m). All samples were processed in triplicates. The used filter materials were first dried in the oven at 105 °C for 24 h to remove water content. Before sieving, large aggregates were gently crushed using a stainless-steel spoon to release small particles. Samples were then sieved using a mechanical sieve shaker with a stainless-steel stack of 500 µm, 125 µm, and 20 µm mesh sizes. Samples were shaken for 10 min, and four size fractions were obtained: >500 µm, 125–500 µm, 20–125 µm, and <20 µm. After sieving, each fraction was weighed and collected in glass jars. The mass percentage of each fraction was calculated.

The fractions < 500 µm, i.e., 125–500 µm, 20–125 µm, and <20 µm, were analyzed for metal content by an external laboratory using ICP-MS according to SS-EN ISO 17294-2:2023 and US EPA Method 200.8:1994.

3.4 Density Separation for MP extraction

Density separation aims to evaluate how effective MPs can be extracted using saturated sodium chloride (NaCl) solution. It was performed on eight layers (A3 0–0.75 m and B3 0–0.65 m), Table 2, and all samples were processed in duplicates. Before density separation, the dry matter content of each sample was determined to calculate the approximate volume of NaCl solution and ultrapure water (Milli-Q) required. Approximately 2 g of wet sediment was weighted into an aluminum cup and dried in an oven at 105 °C for 24 h. The moisture content was calculated according to the following equation:

$$\text{Moisture ratio} = \text{dry sediment mass} / \text{wet sediment mass}.$$

Based on the measured moisture content, the volume of Milli-Q water to be added to each sample was calculated. Density separation was conducted following the method described by Claessens et al. (2011), using a soil to salt solution ratio of 1:3 (w/v). The amount of NaCl required to obtain a saturated solution (360 g/L) was calculated accordingly. NaCl was added to each sample, followed by Milli-Q water. The samples were shaken on a shaking table for 1 h. After shaking, the samples were covered with lids and left undisturbed overnight to allow separation. On the following day, the supernatant was decanted. The remaining solids were

then washed with 1:1 (w/v) Milli-Q water to remove residual salt, and shaken for 10 min, and left to settle for 2–3 hours (Figure 1). The washed solid samples were collected and sent to an external laboratory using Pyro-GC-MS, for analyzing MPs ($>10\ \mu\text{m}$) and rubber components ($>10\ \mu\text{m}$), covering a total of 13 polymer types.

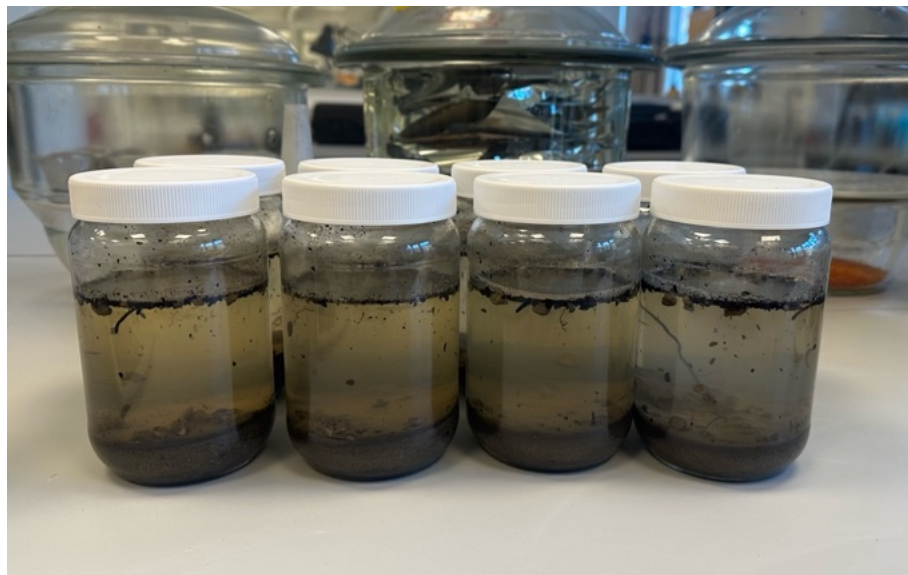


Figure 1 Density separation conducted on the used materials from the A3 filter. Light particles floated on the surface of liquid, while other particles stayed in the bottom.

3.5 Combined Acid Leaching and Density Separation

In order to investigate the influence of treatment sequence on combined metal recovery and MPs removal, three different experimental sequences were designed Figure 2.

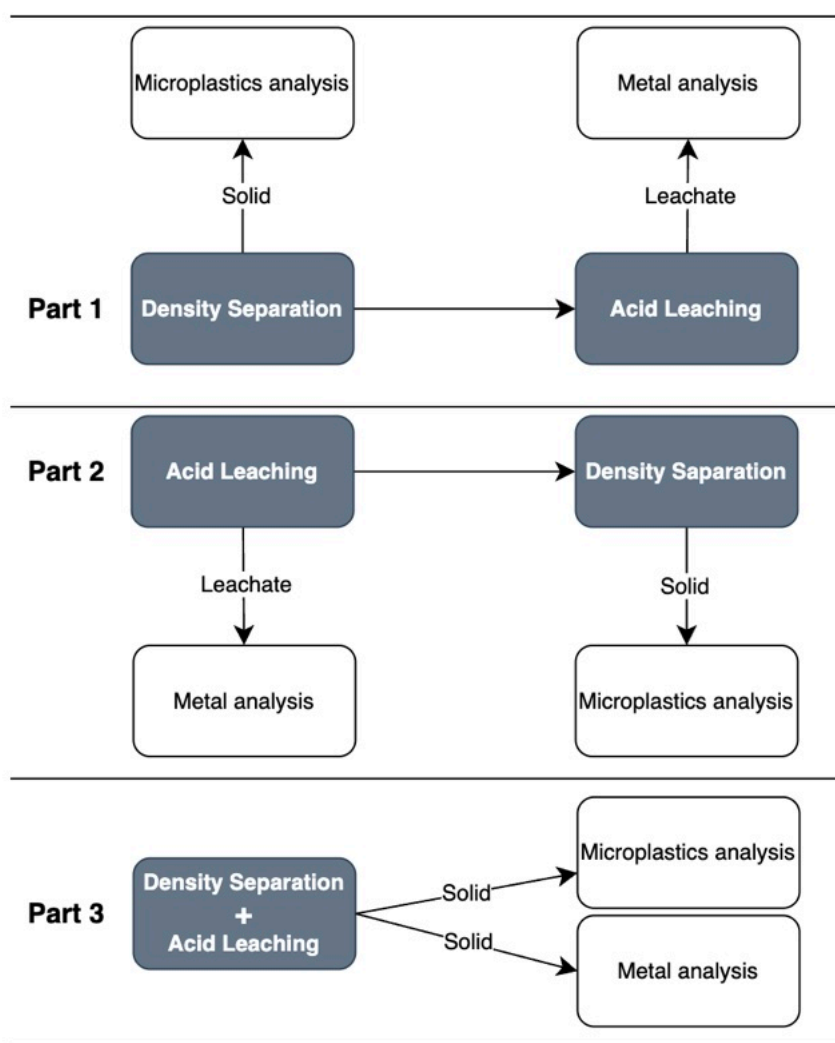


Figure 2 Experimental flowchart used for leaching metals and removing MPs

1 M HCl was selected as the leaching agent due to its effective in metal extraction (Tang & Steenari, 2016), safer handling and the potential scaling-up. In contrast, HNO₃ is strongly acidic and oxidizing and may generate toxic nitrogen oxide gases during operation. Also, HCl is widely available as an industrial byproduct (Kafle et al., 2024). A liquid-to-solid ratio of 3 was applied in all leaching experiments. A3 filter was selected due to its high metal contents. For all the experiments, soil was dried in the oven at 50 °C for 24 h.

In part 1, acid leaching was conducted after density separation. After density separation (described in Section 3.4), 5 g of dried sample (A3 0.15–0.35 m, A3 0.35–0.55 m, A3 0.55–0.75 m; duplicate) was placed in plastics tubes, and 15 mL 1 M HCl was added. The treatment was performed in a duplicate. Samples were shaken for 1 h, then the leachate was collected and filtered with 0.45 µm syringe filter and stored in plastics tubes for external metal analysis.

In part 2, acid leaching was conducted prior to density separation. 1.5 L 1 M HCl was added to 500 g dried sample (A3 0.35–0.55 m; single sample) and was shaken for 1 h. The leachate was collected, filtered (0.45 µm), and stored for metal analysis. Density separation was then performed on solid residues. After density separation, the solid was collected for MPs analysis.

In part 3, acid leaching was combined with density separation. 1.5 L 1 M HCl and 540 g NaCl were added to 500 g dried sample (A3 0.35–0.55 m; single sample) and shaken for 1 h, followed by the density separation. The washed solid was collected for both metal and MPs analysis. In part 3, solid samples instead of the leachate were sent for metal analysis, as the high chloride concentration in the leachate could potentially interfere with ICP-MS measurements.

All samples were analyzed in external laboratories. Metal contents were analyzed using ICP-MS, and MP contents were analyzed using Pyro-GC-MS.

3.6 Sequential Extraction

Sequential extraction was performed by an external laboratory on layer 0.35–0.55 m from A3 filter to study metal binding forms and the potential mobility. The layer was chosen because of its high metal content, and the analysis was conducted in duplicate at external laboratory according to SS 028113-1. Metal concentrations in the leachates were analyzed using ICP-SFMS, ICP-AES, and AFS depending on the target element.

Sequential extraction includes five steps: (1) adsorbed, exchangeable metals and carbonates were extracted using 1.0M sodium acetate buffer (pH=5); (2) labile organic-bound forms were extracted using 0.1 M sodium pyrophosphate; (3) metals associated with amorphous Fe/Mn oxides were extracted using 0.25 M $\text{NH}_2\text{OH}\cdot\text{HCl}$ at 60 °C; (4) metal bound to crystalline iron oxides were extracted using 1.0 M $\text{NH}_2\text{OH}\cdot\text{HCl}$ in 25% acetic acid at 90 °C; (5) stable organic-bound forms and sulfides were extracted using potassium chlorate in 12 M HCl followed by 4 M HNO_3 at 90 °C.

3.7 Data Processing and Calculations

All calculations were performed on dry substances (DS). A mass balance assumption was applied between the solid and liquid phases during the leaching process.

3.7.1 Calculation of metal contents per kg of filter materials

In the investigated A3 and B3 filters, total metal concentrations in 11 layers, as well as concentrations in three particle size fractions (125–500 μm , 20–125 μm , and <20 μm), were measured. The metal contents in the fraction >500 μm were calculated by following equation:

$$\begin{aligned} \text{Metal contents in } > 500 \mu\text{m} = & \text{Metal contents in total} - (\text{Metal contents in} \\ & < 20 \mu\text{m} + \text{Metal contents in } 20 \mu\text{m} \sim 125 \mu\text{m} \\ & + \text{Metal contents in } 125 \mu\text{m} \sim 500 \mu\text{m}) \end{aligned}$$

The metal contents (mg/kg DS) were converted to metal contents per kg of dry filter materials. Based on the percentage of each size, the metal contents in each fraction were determined.

3.7.2 Calculation of metal contents in original and used filter materials

The metal contents of individual filter materials (e.g. biochar, Hekla Regnbädd, and MIBA) were known (Table 3), as well as their proportions in each layer (Table 2). Based on these

proportions, the expected metal contents in the original filter layers were calculated. These values were then compared with the measured total metal contents in the used filter materials to evaluate accumulation or depletion.

To estimate the total mass of metals in each layer, the mass of the filter materials was calculated. The filter column has a diameter of 1m, and the thickness of each layer was obtained in Table 3 and described in Johansson et al. (2024). Based on the layer volume and corresponding material densities, the mass of each layer was calculated. Compost was not included in the mass calculations due to the lack of reliable density data and its relatively low pollutant contents, as reported by Johansson et al. (2024). The metal contents (mg/kg DS) were then converted to metal contents (mg) in each layer.

Table 3 Metal contents in the original filter materials

Metals mg/kg	Biochar	MIBA	Sandy Loam (Hekla Regnbädd)	Compost
As	<LoI	40	0.93	1.40
Cd	<LoI	3.4	0.050	0.75
Co	0.086	86	4.0	4.8
Cr	3.2	1200	42	20
Cu	1.7	4300	18	30
Ni	0.18	330	22	9.1
Pb	<LoI	880	5.4	11
Zn	13	4200	5.4	130

3.7.3 Calculation of metal concentrations in leachates and treated materials

The total metal content in the used material (mg) was calculated (see Section 3.7.2). The metal content in the leachate (mg) was calculated from the measured concentration ($\mu\text{g/L}$) and leachate volume (L). The metal content remaining in the treated material was obtained by subtracting the metal concentrations in the leachate from that in the used material. Metal contents in the treated material were then expressed as mg/kg DS by normalizing the material mass.

For “Density separation + Acid Leaching” i.e. DS+AL experiment, due to the high chloride concentrations in the leachate, the solid samples were analyzed instead of the leachate. In this experiment, 500 g of solid was leached with 1.5 L of HCl, resulting in 478 g of solid after treatment. Based on the measured metal contents in the original and treated materials, the corresponding metal concentrations in the leachate were calculated.

4 Results and Discussion

4.1 Material Characterization

4.1.1 pH and LOI

The pH and LOI results are presented in Table 4. The original pH of the sorption materials was 9.4 for MIBA and 8.2 for biochar. The surface sandy loam layers (0–0.15 m) showed similar pH (6.6) and LOI (4%–5%) values in both filters.

In the ash A3 filter, pH increased with depth. The MIBA-containing layers showed lower pH values than original ash materials, and the bottom biochar layer also exhibited a lower pH than the original biochar. The decrease of pH may be related to long-term exposure to influent stormwater, which has a lower pH (around 6–8) than these sorption materials, as well as the leaching of alkaline components from the ash material. Similarly, in biochar B3 filter, pH values in the biochar-containing layers and the bottom biochar layer were lower than in the original biochar materials. Comparing the two filters, the ash A3 filter showed higher pH values than the biochar B3 filter, likely due to the alkaline nature of the MIBA material. In both filters, LOI generally increased with depth. This trend suggests that organic matter degradation was more pronounced in the upper layers. Comparing the two filters, the biochar-containing layers showed higher LOI values than MIBA-containing layers. This difference is attributed to the presence of 40% biochar in the B3 filter, which contributes to the organic matter contents.

Table 4 pH and LOI in the ash A3 filter and biochar B3 filter

Filter	Layer	pH	LOI
A3	0–0.15 sandy loam	6.6	5%
	0.15–0.35 sandy loam/MIBA (50%)/compost	8.3	5%
	0.35–0.55 sandy loam/MIBA (50%)/compost	9.0	6%
	0.55–0.75 sandy loam/MIBA (50%)/compost	9.1	7%
	0.75–0.80 biochar	7.8	27%
B3	0–0.15 sandy loam	6.6	4%
	0.15–0.30 sandy loam/biochar (40%)	6.6	13%
	0.30–0.45 sandy loam/biochar (40%)	6.4	13%
	0.45–0.60 sandy loam/biochar (40%)	6.8	16%
	0.65–0.75 biochar	6.0	22%

4.1.2 MP contents in the depth profiles

Microplastics were quantified in all four layers of the ash A3 filter, i.e. 0–0.15 m (sandy loam), and three middle layers (sandy loam/MIBA/compost) including 0.15–0.35 m, 0.35–0.55 m, and 0.55–0.75 m, see Figure 3. Detail results are presented in Appendix 3. The dominant polymer types were polyethylene (PE), polypropylene (PP), and polystyrene (PS), which are commonly reported in urban environments (Lange et al., 2023; Liu et al., 2019). Polypropylene occurred in the highest content, reaching 10000 µg/kg DS in the three-middle MIBA. Polyethylene has relatively similar contents in the 0–0.15 m, 0.35–0.55 m and 0.55–0.75 m layers, while contents in the 0.15–0.35 m layer were below the limit of quantification (LoQ). For PS, the highest

contents showed in the layer 0.15–0.35 m (around 3000 µg/kg DS), but it is much lower in other layers. For rubber components, only the top layer contains detectable levels. Polyisoprene (PI) has a high content (around 1200 µg/kg DS), followed by polybutadiene (PB) and styrene-butadiene rubber (SBR).

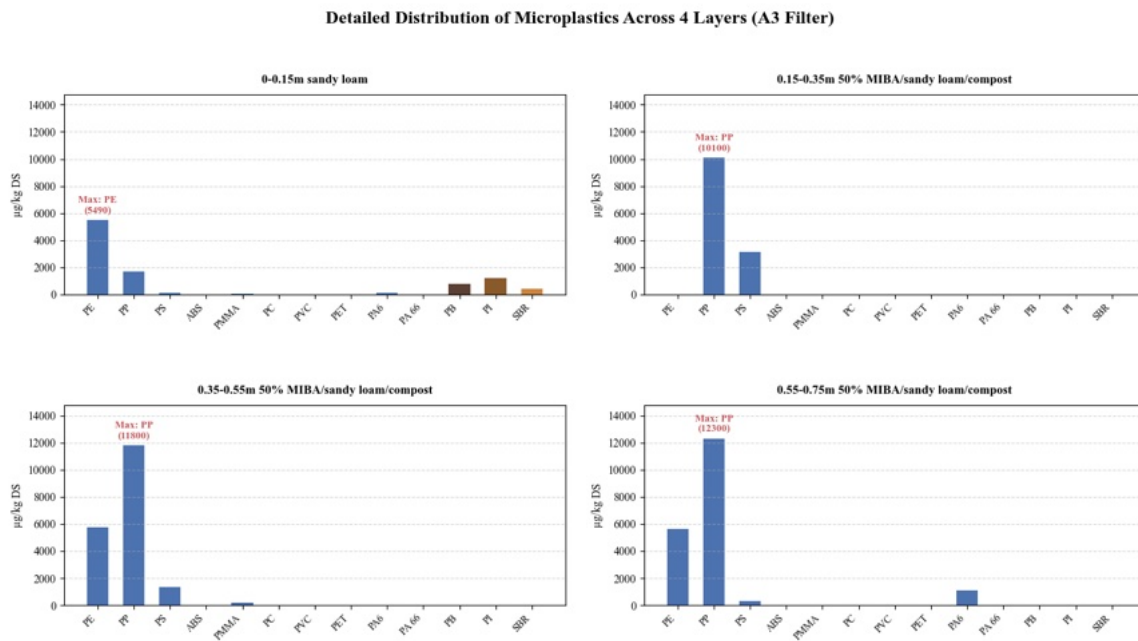


Figure 3 Microplastic contents in different layers with depth of the filter ash A3 filter

In the biochar filter B3, MPs were only quantified in the top layer, while concentrations in the deeper layers were below the LoQ, see Figure 4. The absence of MPs > LoQ in deeper layers may be related to methodological limitations and analytical constraints associated with MP identification in complex matrices such as biochar. In the top layer, PP and PS were the only identified polymer types. Rubber components were only found in the top layer, like the ash A3 filter, and PI occurred in the highest contents (around 1500 µg/kg DS), followed by PB and SBR. Biochar has been reported as an effective adsorbent for MP removal. However, most previous studies focused on MP concentrations in inflow and outflow water, while few studies have examined MP accumulation within the filter layer or the biochar material itself after use. One study reported that MPs could be stuck, trapped, and entangled within biochar (Wang et al., 2020).

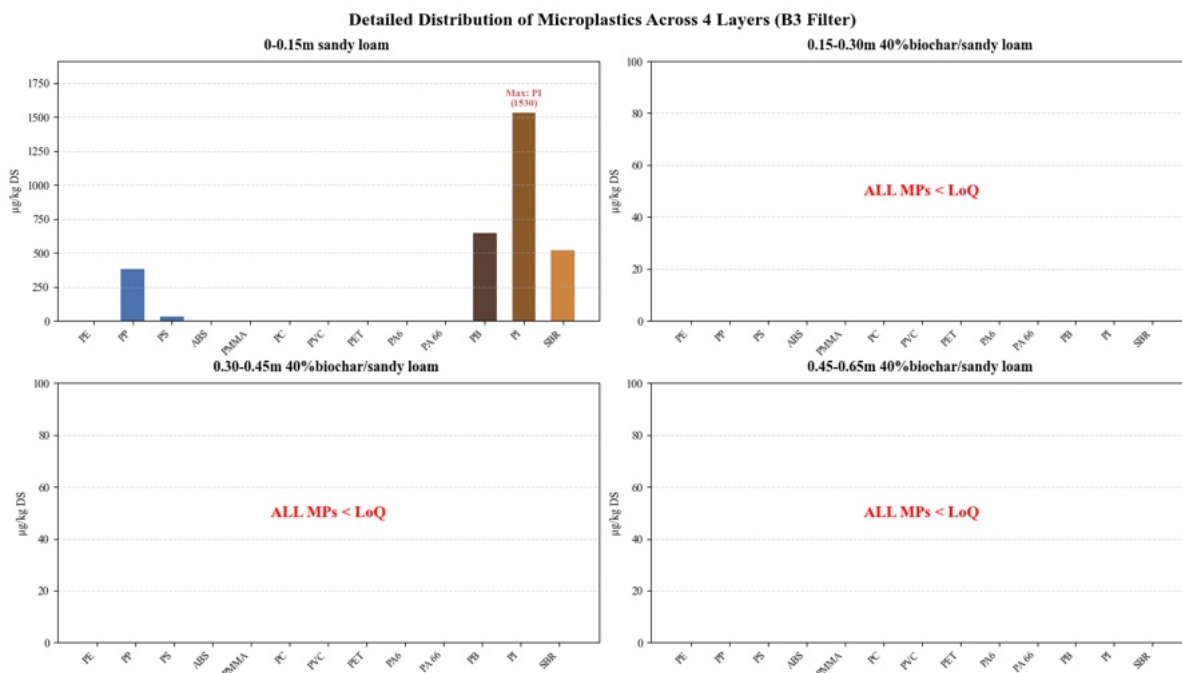


Figure 4 Microplastic contents in different layers of the biochar B3 filter. Microplastics were only found in 0–0.15 m sandy loam layer.

Comparison between the filters

Due to the lack of MPs in the deeper layers of the biochar filter B3, the direct comparison between the two filters is primarily limited to the topsoil layers, see Figure 5. The dominant polymers identified in this study, including PP, PE, and PS, are commonly reported in urban environments (Wang et al., 2022). In this layer, the ash A3 filter shows substantially higher MP content compared to B3. In contrast, rubber contents were within a similar level in both filters. Since the topsoil layers of A3 and B3 consist of identical materials and were exposed to the same stormwater, similar MP levels are expected. One possible explanation for the higher MP contents in A3 is that some MPs originated from the MIBA material itself, since studies have reported that the incineration process may not completely eliminate MPs (Shen et al., 2021; Yang et al., 2021). Although unlikely, transport or redistribution of nanoplastics particles within the filter system through plant-related processes cannot be excluded (Azeem et al., 2021). The rubber polymers found were likely associated with tyre and road wear particles from stormwater runoff, such as SBR, PB, and PI, which are commonly reported in urban environments (Galfi et al., 2025; Järnlskog et al., 2020). The similar rubber content observed in both filters suggests that these particles were mainly from stormwater runoff and were effectively retained near the surface layer. Many studies have also reported that MPs tend to be accumulated in surface layers and decrease with depth in bioretention filters (Koutnik et al., 2022; Lange et al., 2023). In our case, the B3 filter generally follows this pattern, with MPs only quantified in the top layer. In contrast, the A3 filter did not show a clear depth-dependent decrease, as relatively high MPs are observed in deeper layers compared to the upper layer.

Previous monitoring of similar bioretention filters with the same design as A3 and B3 showed high removal efficiencies for MPs in outgoing water (Johansson et al., 2024). This indicates that MPs were largely retained with the filters rather than transported through the systems. Microplastics analysis in complex matrices such as biochar and MIBA remains analytically challenging, and the reported MP contents should be regarded as indicative rather than the absolute values.

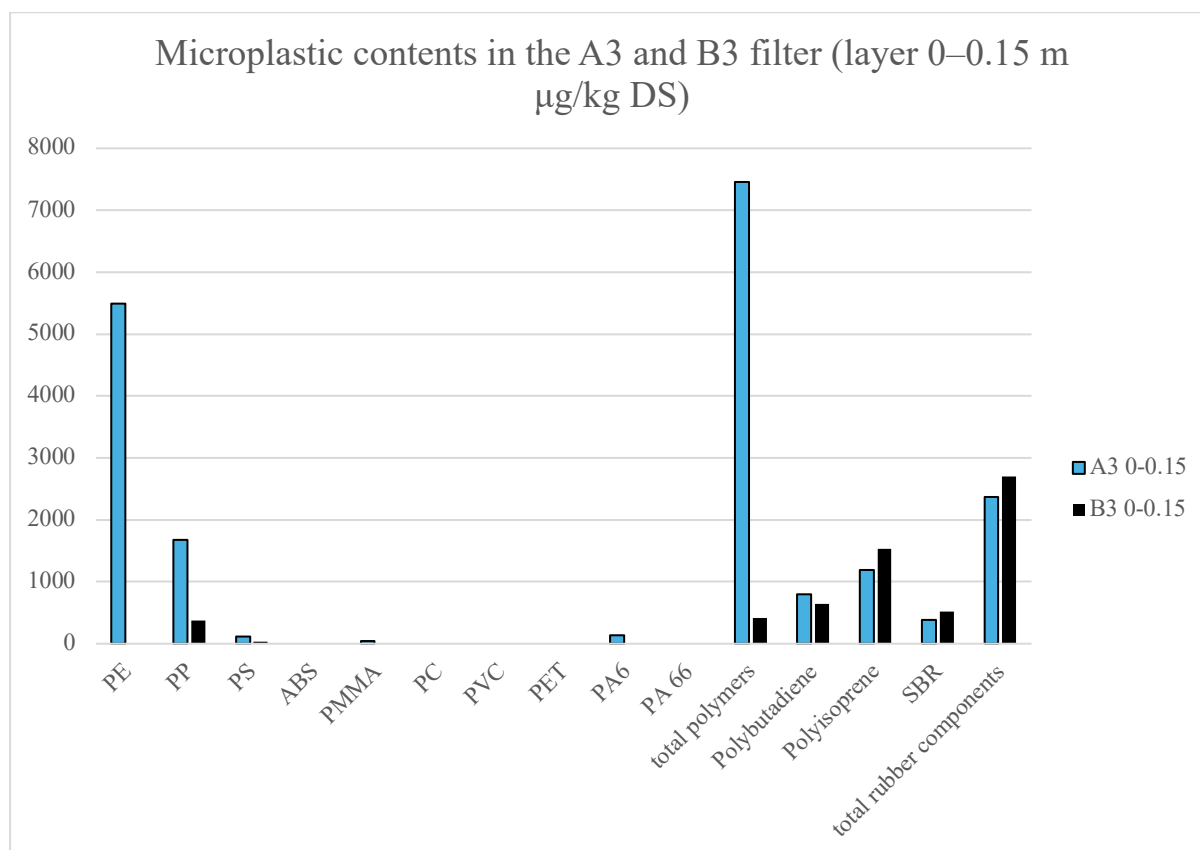


Figure 5 Comparison of MP contents in the ash A3 filter and the biochar B3 filter, in layer 0-0.15 m with sandy loam.

4.1.3 Metal contents along the depth profiles

The distribution of trace metals (As, Ba, Cd, Co, Cr, Hg, Ni, Pb, W, V, Sn, and Zn) within the filters was investigated. The complete results are provided in Appendix 1 and Appendix 2. The discussion below mainly focuses on trace metals with high concentrations, including Cd, Co, Cr, Cu, Ni, Pb, Zn. These metals are commonly reported among the dominant traffic-related metals in stormwater and roadside ditches (Polukarova et al., 2025). Metal contents were compared with the Swedish guideline values for contaminated land under less sensitive land use (MKM, mindre känslig markanvändning) (Naturvårdsverkets Generella Riktvärden För Förorenad Mark (mg/kg TS), 2025).

Trafficked-related metals, including Ba, Cd, Cr, Co, Cu, Pb, Ni and Zn (Hanfi et al., 2019), exceeded the MKM guideline values in most layers of the ash A3 filter. These metals were selected for further discussion, see Figure 6. Overall, the top layer that consists of sandy loam had lower metal contents than the three middle layers that consist of 50% MIBA, which is

expected and attributed to the presence of metals in the MIBA materials. Among the middle layers that consisted of sandy loam, MIBA, and compost, the 0.35–0.55 m layer exhibited the highest contents, followed by the 0.55–0.75 m layer. In layer at 0.35–0.55 m, Zn showed the highest metal content among all metals, with 3622 mg/kg, followed by Cu, Cr, Pb, Ni, and Cr. The layer at 0.15–0.35 m (sandy loam), showed lower contents than the 0.35–0.55 m layer and the 0.55–0.75 m layer, which may suggest downward migration of metals released either from the MIBA material or from infiltrated stormwater, resulting in accumulation in the deeper layers. The bottom layer that consists of pure biochar, also showed higher metal contents than the top layer, which further indicates the downward transport and retention of metal within the filter profile.

Regarding particle size distribution, metal concentrations generally increased with decreasing particle size in most layers. This trend is expected due to the larger specific area and sorption capacity of finer particles (Huang et al., 2020). In the bottom biochar layer, however, some larger fractions (125–500 μm , 20–125 μm) had higher metal contents than the smallest fraction for most metals. This may partly be explained by agglomeration of fine particles under pressure in the bottom layer, causing small metal-rich particles to remain attached to larger particles during sieving and thereby resulting in higher metal contents in the larger fractions.

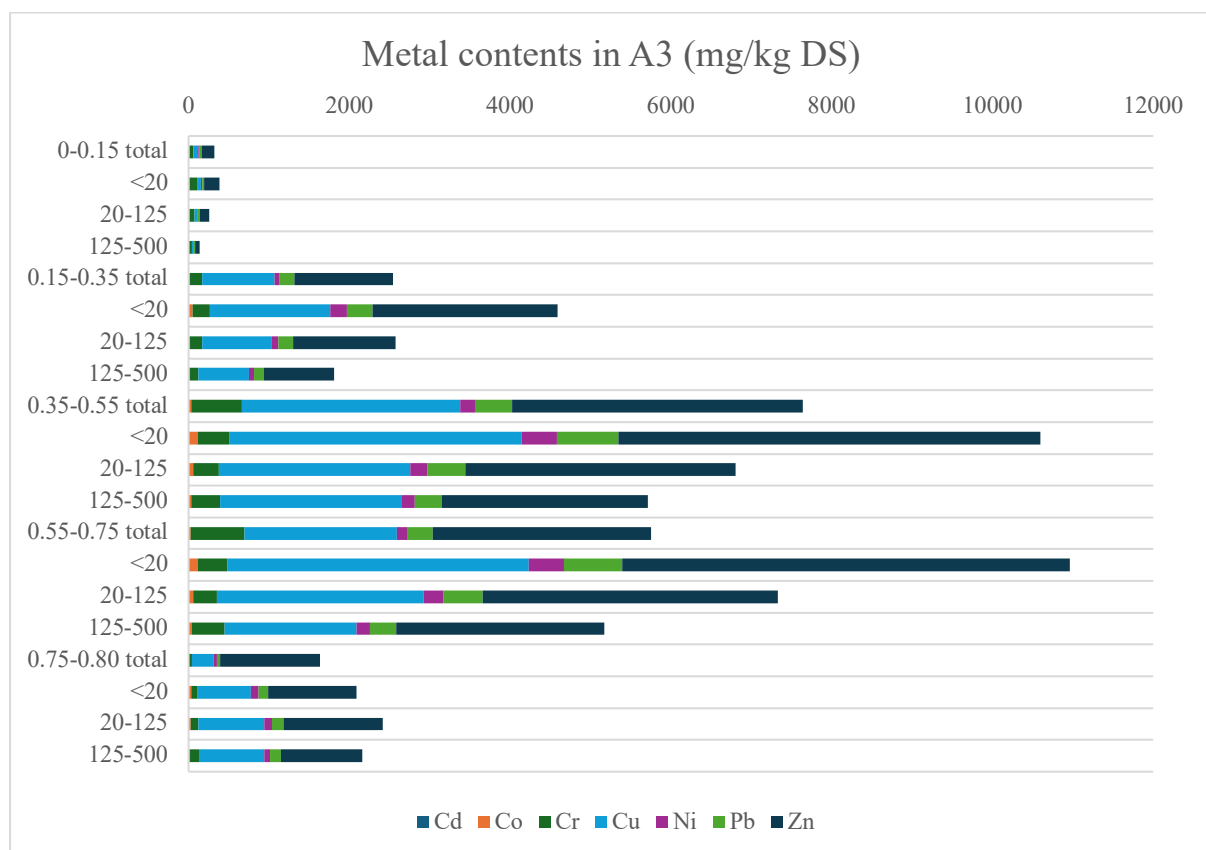


Figure 6 Metal contents in the ash A3 filter, regarding different layers and different size fractions. "DS" = dry substance, "total"=the metal contents in un-sieved materials, "<20"=particle size smaller than 20 μm , "20–125"=particle size between 20–125 μm , "125–500"=particle size between 125–500 μm .

Filter with biochar as the major materials, the B3 filter, only Ba exceeded the MKM guideline value in the biochar B3 filter. Although Ba is an abundant element in the earth's crust (Pean et al., 2021), it has been reported to be associated with non-exhaust vehicle emissions such as brake wear (Gietl et al., 2010). In general, metal contents decreased with depth, see Figure 7, which is consistent with observations reported in previous studies of bioretention systems and indicates that the accumulated metals mainly originated from stormwater inflow. The surface layer showed the highest metal contents, with Zn reaching 88 mg/kg, followed by Cr, Cu, Pb, Ni, and Cd. The three middle layers showed a slight decrease with depth but generally exhibited similar levels of metal contents, while the bottom layer showed the lowest contents. Similar to the ash A3 filter, metal contents generally increased with decreasing particle size, with the highest metal contents observed in the finest fractions. For Ni, the finest fraction in the bottom layer had the highest metal content (27 mg/kg) among all layers. Since this pattern was not observed for other metals or layers, it may represent an outlier.

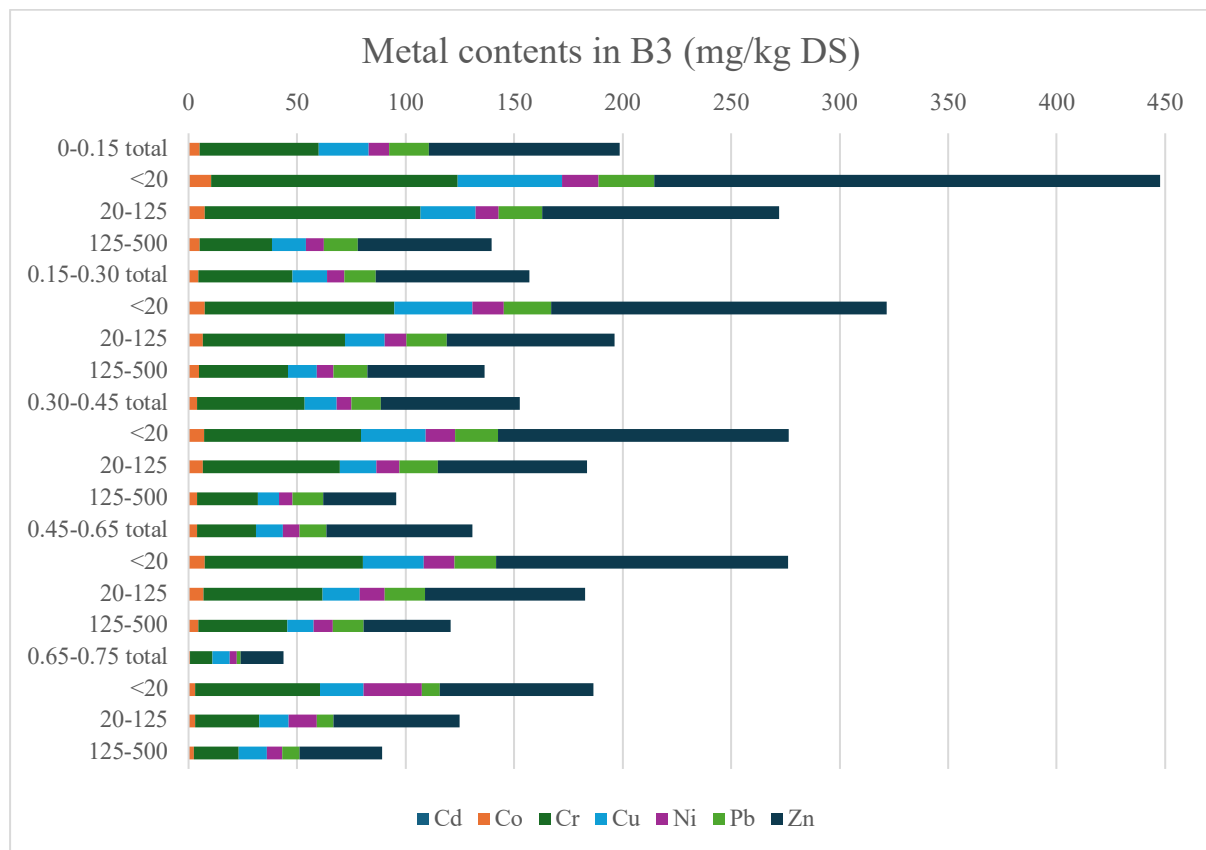


Figure 7 Metal contents in the biochar B3 filter, regarding different layers and different size fractions. "DS" = dry substance, "total" = the metal contents in un-sieved materials, "<20" = particle size smaller than 20 μm , "20–125" = particle size between 20–125 μm , "125–500" = particle size between 125–500 μm .

Comparison between filters

The observed depth profiles in both the ash A3 and biochar B3 filters suggest downward migration of metals originating either from stormwater input or from the MIBA-containing layers. Similar depth-dependent patterns have been reported in previous studies on bioretention systems. For example, Kluge et al. (2018) investigated bioretention systems that had operated for more than 10 years and found that most metal accumulations were concentrated within the

upper 20cm of the filter profile, while concentrations decreased rapidly with depth. Comparable trends of decreasing metal contents with depth have also been reported by Al-Ameri et al. (2018), Gilbreath et al. (2019) and Chu et al. (2021).

In the surface layer, the two filters generally showed a similar level of metal contents, while in the sorbent-containing layers, the A3 filter contained much higher metal contents than the B3 filter. The large difference between the two filters is likely related to their different material compositions. The A3 filter contains MIBA in the middle layers, which is known to contain metal contents and may release metals (Karlfeldt Fedje et al., 2021; Zhang et al., 2008)). Comparison of the surface layers between the two filters is more relevant, as both filters contain the same materials in this layer and were exposed to the same stormwater. In general, most metals showed relatively similar contents between the two filters. Copper and Zn showed noticeably higher contents in the A3 filter, with Cu reaching 86 mg/kg in A3 compared with 23 mg/kg in B3, Zn reaching 162 mg/kg in A3 compared with 88 mg/kg in B3. Since the surface layer and the conditions were identical, such differences were not expected.

One possible explanation is that plant-related water transport processes were involved, such as hydraulic lift, where water is transported upwards through root systems from the moist subsurface layer to the drier surface layer, and the lifted water can be released into the soil to support the plants during dry days (Liste & White, 2008). In the A3 filter, MIBA materials originally contained metals, which may have contributed to the elevated metal contents in the surface layer through this process. Zinc and Cu had the highest metal contents in both filters. Sequential extraction results showed that Zn in the MIBA materials was relatively mobile (Figure 11), and the mobility of Cu may also increase in the presence of organic matter. During excavation of the filters, extensive root systems were observed, with roots extending into the biochar layers of the filter. It is therefore possible that dissolved metals migrated within the filters and were redistributed in the surface layer.

Based on the proportion of each size fraction, the corresponding metal contents per 1 kg of dry filter materials were calculated (Figure 8 and Figure 9). Although the smallest fraction showed the highest metal contents in most layers, this fraction accounted for only about 1% of the total dry mass in each layer in both kinds of filters (Table 5 and Table 6), i.e., approximately 0–8 g of metals in 1 kg of filter materials. In contrast, the larger fractions such as 125–500 μm , 20–125 μm accounted for approximately 87%–95% of the total dry mass. Consequently, the majority of the total metal contents were associated with the larger particle fractions, especially with >500 μm in both the ash and biochar filter. This suggests that removing only the finest particle fraction is insufficient to reduce contamination levels. Further fractionation of particles >500 μm is needed to identify size ranges with lower pollutant contents and sufficiently large material quantities for potential separation and management.

Table 5 The proportion of different size fractions in different layers of the ash A3 filter

Size fraction (μm)	0–0.15 m Sandy loam	0.15–0.35 m Sandy loam/MIBA (50%)/compost	0.35–0.55 m	0.55–0.75 m	0.75–0.80 m Biochar
>500	38%	50%	64%	64%	87%
125–500	49%	39%	28%	28%	8%
20–125	12%	10%	8%	7%	4%
<20	1%	1%	1%	1%	1%

Table 6 The proportion of different size fractions in different layers of the biochar B3 filter

Size fraction (μm)	0–0.15 m Sandy loam	0.15–0.30 m Sandy loam/biochar (40%)	0.30–0.45 m	0.45–0.65 m	0.65–0.75 m Biochar
>500	40%	46%	47%	49%	79%
125–500	47%	42%	41%	40%	14%
20–125	12%	11%	10%	10%	6%
<20	1%	1%	2%	1%	1%

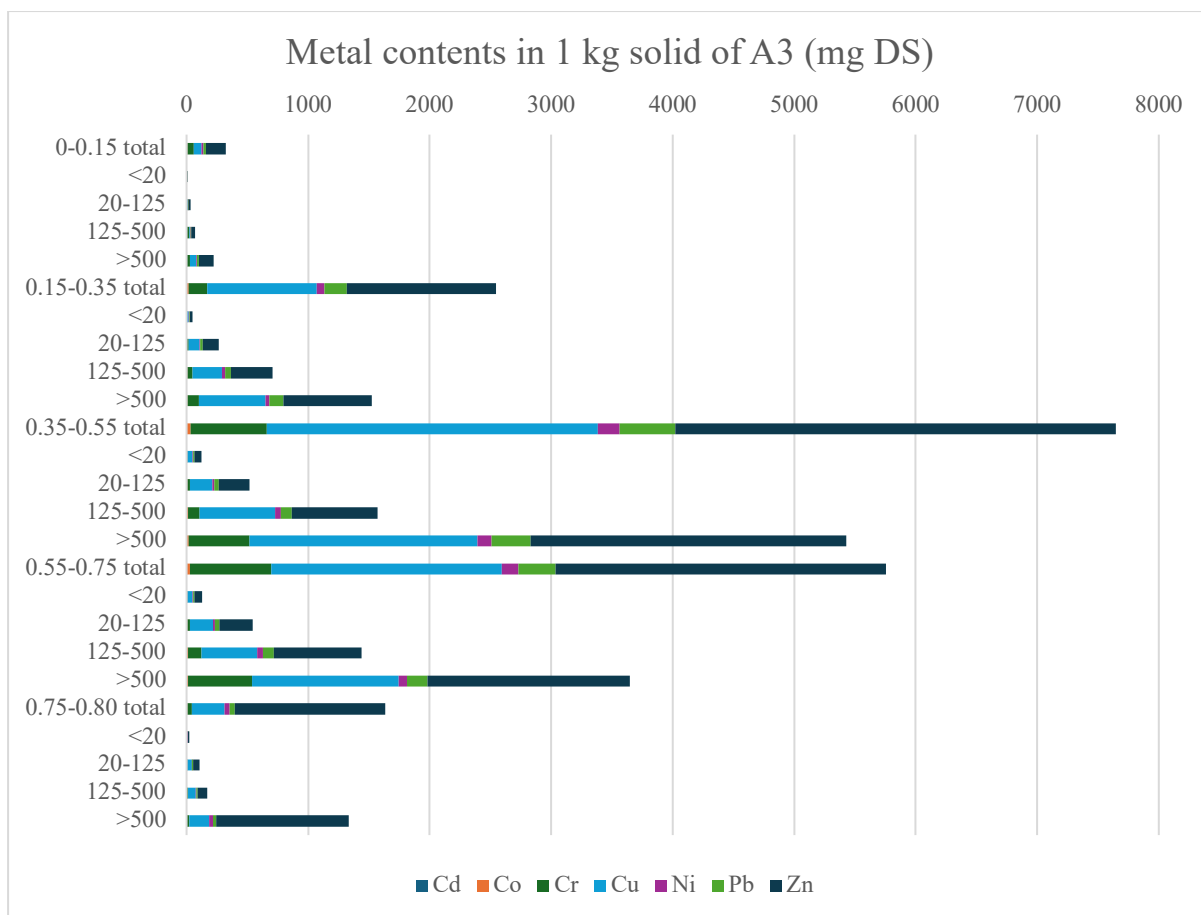


Figure 8 Metal contents in 1 kg/dried materials in the corresponding layers, in the ash A3 filter. "DS" = dry substance, "total"=the metal contents in un-sieved materials, "<20"=particle size smaller than 20 μm , "20-125"=particle size between 20-125 μm , "125-500"=particle size between 125-500 μm .

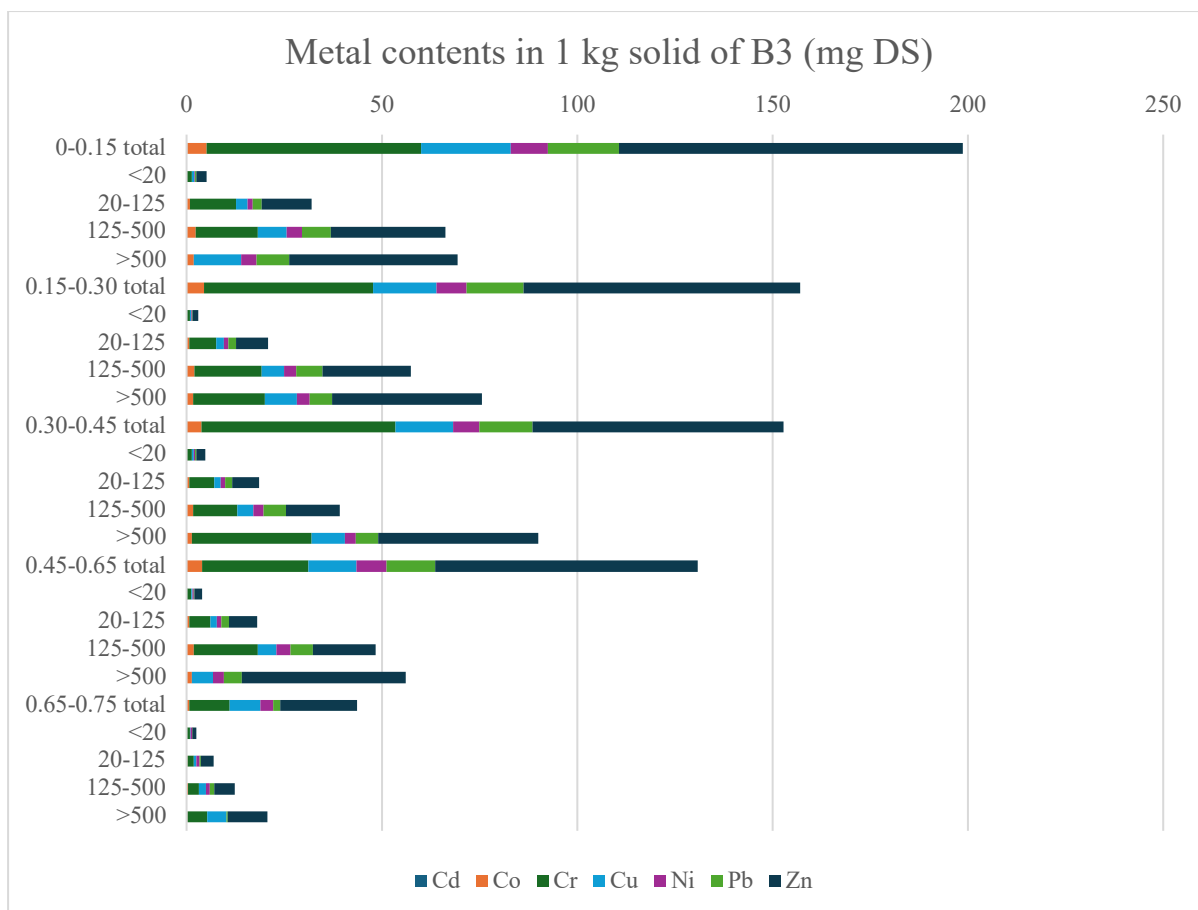


Figure 9 Metal contents in 1 kg of dried materials in the corresponding layers, in the biochar B3 filter. "DS" = dry substance, "total" = the metal contents in un-sieved materials, "<20" = particle size smaller than 20 μm , "20–125" = particle size between 20–125 μm , "125–500" = particle size between 125–500 μm .

4.1.4 Comparison of metal contents in the used materials and original materials

Metal contents in the original and used materials were compared, as shown in Figure 10.

The ash A3 filter showed a clear pattern of metal migration can be observed along the depth gradient, see Figure 10. In the top sandy loam layer (0–0.15 m), most metals contents increased compared with the initial material due to the stormwater addition. The largest increase was observed for Zn (157 mg/kg), followed by Cu (48 mg/kg), while As and Ni showed a slight decrease of 1 mg/kg and 9 mg/kg, respectively. The three following layers contained a mixture of sandy loam, MIBA, and compost. In the 0.15–0.35 m layer, all metals showed a substantial decrease, ranging from 1 to 1260 mg/kg. The largest decrease was observed for Cu (1260 mg/kg), followed by Zn (896 mg/kg) and Cr (464 mg/kg). This pattern suggests leaching metals from the MIBA materials. Increased metal contents observed in the 0.35–0.55 m layer indicate possible downward migration from the upper layers. Further down, in the 0.55–0.75 m layer, both increases and decreases are observed, which can indicate a combination of downward transport from upper layers and release from the MIBA layer itself. Altogether, metals originating from stormwater and/or released from MIBA accumulated in the biochar layer (0.75–0.80 m), where all metals showed increased contents. The biochar layer acted as a sink for metals transported downwards through the filter profile. The accumulation of metals in the

biochar layer also indicates a potential for resource recovery, as the used biochar could be replaced during filter maintenance and utilized for metal recovery.

In biochar B3 filter, the three middle layers contained a mixture of sandy loam and biochar. Most metals showed increased content in all layers, see Figure 10, although the depth profiles differed between metals. Like the ash A3 filter, Zn showed the largest increase in the top layer (80 mg/kg), and gradually smaller increases with depth. Similar patterns were observed for Cu, Pb, and Cd. In contrast, Cr showed increasing contents with depth, reaching the highest increase in the sandy loam/40% biochar 0.30–0.45 m layer (23 mg/kg), followed by a decrease in the 0.45–0.65 m layer (0.7 mg/kg) and then an increase in the pure biochar 0.65–0.75 m layer (7 mg/kg). The decreased contents were observed for As and Ni. All metals showed increased contents in the pure biochar layer 0.75–0.80 m, with Cr increasing by around 7 mg/kg and Cu and Zn increasing by around 6 mg/kg.

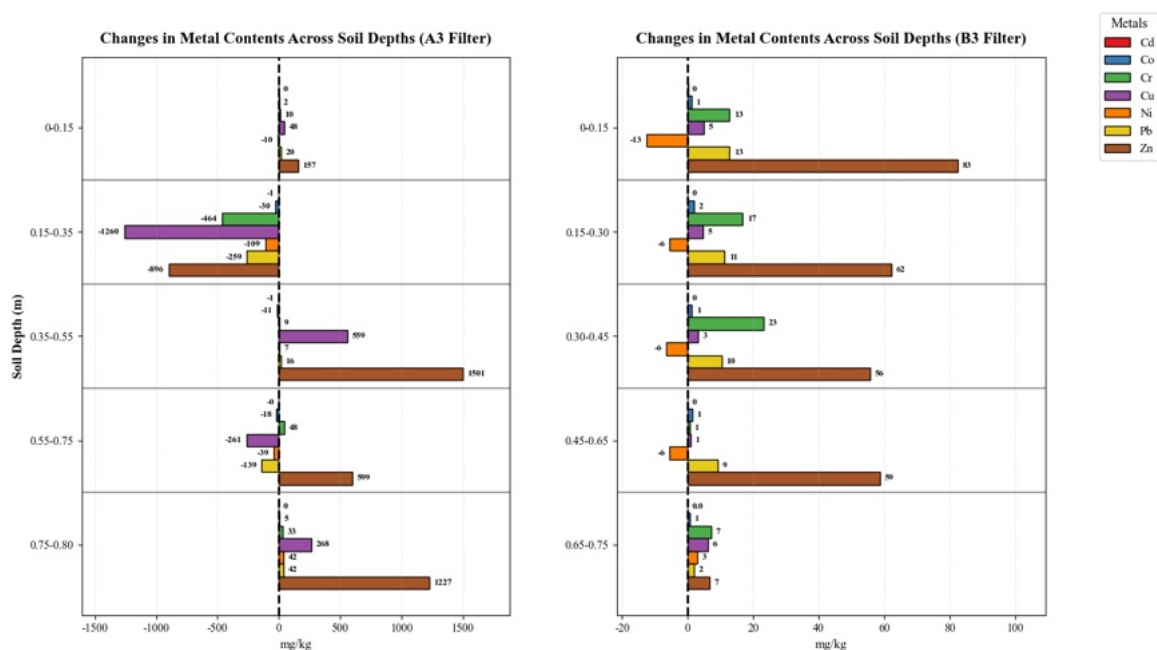


Figure 10 Comparison of metal contents in the original materials and the used materials in different depth layers of the ash A3 filter and biochar B3 filter

Comparison between filters

Both similarities and differences can be identified. In both systems, most metals increased in the top layer, and Cr, Cu, and Zn exhibited significant changes in all layers. Nickel showed a decrease in the top layer of both ash A3 and Biochar B3 filters, as well as most layers in the B3 filter, which may be associated with the release of Ni previously reported for Hekla Regnbádd materials (Søberg et al., 2019). The top layers of A3 and B3 filters have identical materials and therefore showed generally similar metal concentrations. However, again, Cu and Zn concentrations differed considerably between filters. Copper contents are approximately three times higher in the top layer of A3, and Zn contents are about two times higher compared to B3. Differences between the two filters become more apparent in the

middle layers. The presence of MIBA in A3 leads to the release of metals, whereas biochar in B3 is less likely to contribute to metal release, resulting in different patterns.

4.1.5 Sequential extraction

Sequential extraction was conducted on the layer 0.35–0.55 m (sandy loam/MIBA/compost) in A3 filter, as this layer contained the highest metal contents and was initially expected to have the highest mobility, as metals released from the overlying 0.15–0.35 m sandy loam/MIBA/compost layer were assumed to migrate downwards into this layer in more mobile and less bound forms. The results are presented in Figure 11, and the detailed data is provided in Appendix 5. Cadmium and Zn exhibit high mobility, with more than 50% present in the adsorbed and exchangeable fractions, and carbonates (step 1). This high proportion would suggest high leachability of these metals, while elevated concentrations of Cd and Zn were not observed in the filter effluent. One possible explanation is the difference between sequential extraction procedures and actual filtration conditions. Sequential extraction involves intensive chemical processes and vigorous shaking, which may enhance metal release compared to the slower and less aggressive processes occurring during water infiltration through the filters. Chromium and Ni were relatively stable, as less than 10% present in the exchangeable fraction, and the majority is associated with more stable fractions (steps 4 and 5). For Pb and Cu, approximately 20–30% were present in the exchangeable fraction, while more than 50% were present in stable fractions (steps 4 and 5). For most elements, the proportion in step 2 (labile organic fraction) was below 10%, suggesting that organic matter had a limited influence on metal binding. This may be related to the degradation of compost and/or the incineration, which had combusted organic matter.

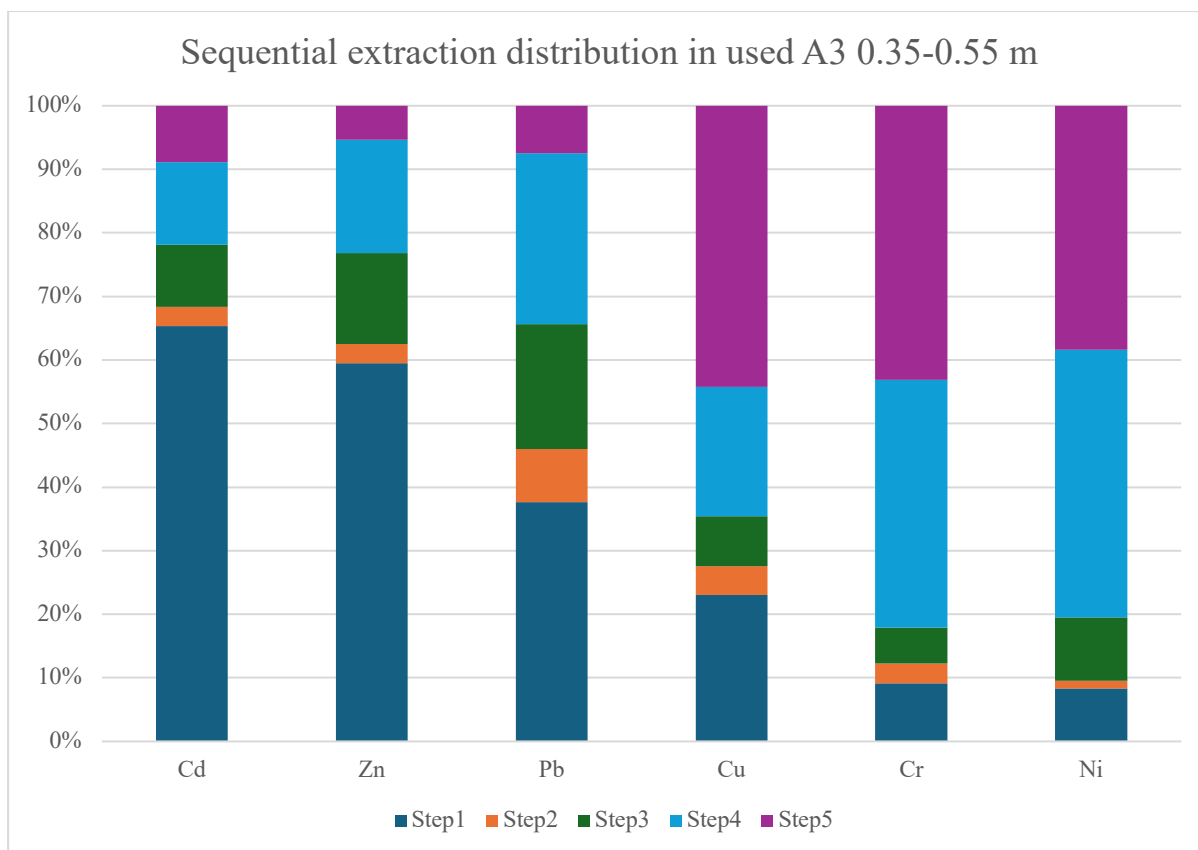


Figure 11 Sequential extraction distribution in the used ash A3 filter 0.35–0.55 m. This layer consisted of 50% MIBA, 35% sandy loam, and 15% of compost. Step 1: adsorbed, exchangeable metals and carbonates; Step 2: labile organic-bound forms; Step3: metals associated with amorphous Fe/Mn oxides; Step 4: metals bound to crystalline iron oxides; Step 5: stable organic-bound forms and sulfides.

A previous study conducted by Karlfeldt Fedje et al. (2021) on fresh and pure MIBA from the same treatment plant, showed generally similar fractionation patterns for several elements, see Figure 12. The materials in this study consisted of MIBA mixed with sandy loam and compost. In both studies, Zn and Cd are mainly present in exchangeable forms, with around 65% of Cd present in step 1 for both materials, and Zn accounted for 67% in fresh MIBA and 59% in the used material. Nickel and Cr are mainly in stable forms in both materials. Copper was predominantly associated with stable fractions in both fresh MIBA and this layer, while the proportion of exchangeable Cu (step1) increased in the used material (from around 10% in fresh MIBA to around 20% in this layer).

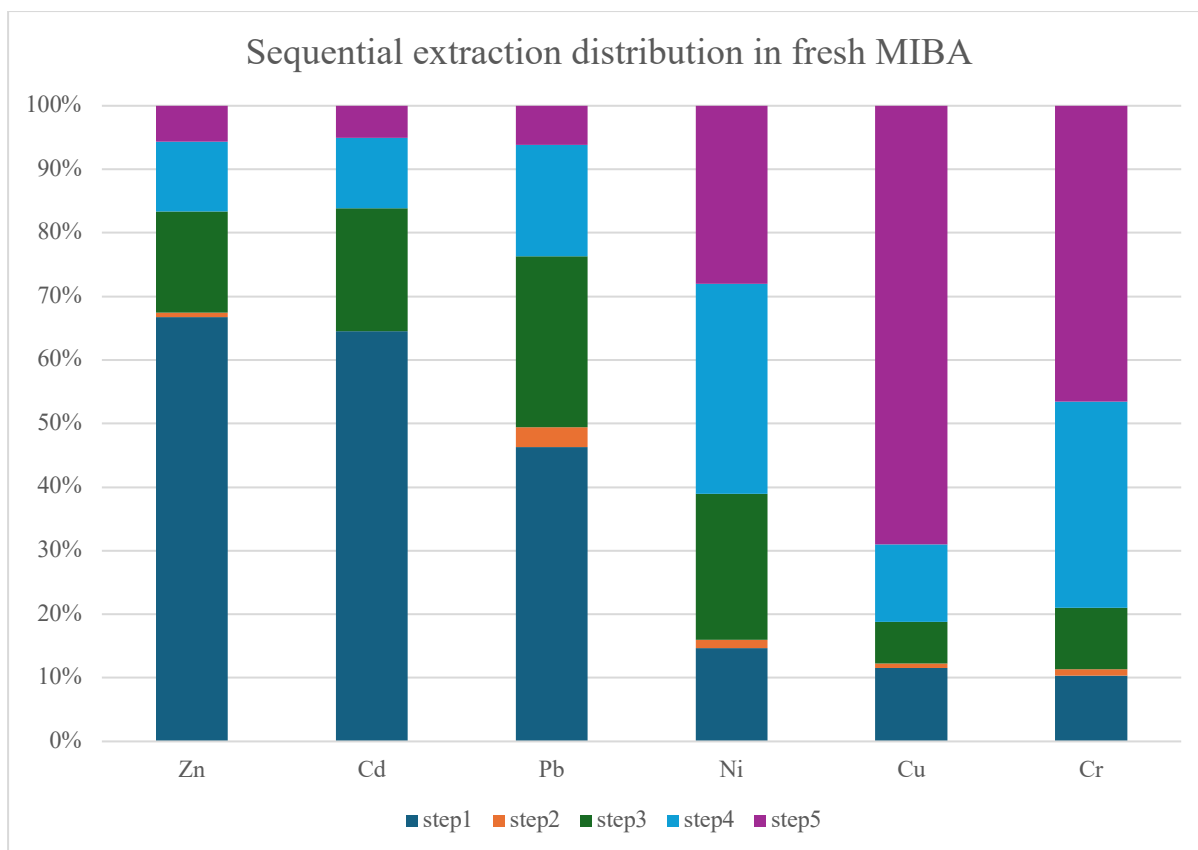


Figure 12 Sequential extraction distribution in fresh and pure MIBA. Step 1: adsorbed, exchangeable metals and carbonates; Step 2: labile organic-bound forms; Step 3: metals associated with amorphous Fe/Mn oxides; Step 4: metal bound to crystalline iron oxides; Step 5: stable organic-bound forms and sulfides.

4.2 Treatment of the Filter Materials

4.2.1 Density separation for MP recovery

No consistent trend in polymer contents was observed after density separation (Figure 13). The detailed results are presented in Appendix 4. While certain polymers showed a great decrease after treatment, others remained relatively unchanged or even increased compared to the untreated samples. In general, most layers in the ash A3 filter showed decreased total polymer contents after treatment, whereas slight increases were observed in some layers and polymer types. Despite being below the LoQ in untreated samples, some polymers were found after treatment, such as PVC and ABS. Noticeable decreases were observed for several low-density polymers, particularly for PE and PP, showing that NaCl treatment was capable of separating at least part of these polymers from the filter materials. However, rubber components remained relatively similar before and after density separation. Although polymers such as PI, PB, and SBR have a density lower than 1 g/cm³, these compounds are commonly used as markers for tyre and road wear particles in pyro-GC-MS analyses rather than rubber particles themselves. Tyre and road wear particles exhibit higher densities in the range of 1.3–1.7 g/cm³ (Klößner et al., 2021). Consequently, these particles would not be expected to float in saturated NaCl solution, which may explain the limited separation observed here. Higher density solutions such as ZnCl₂ and NaI could potentially separate TRWP, but these solutions are generally more expensive and hazardous than NaCl. Since the study aims to evaluate treatment approaches

with potential for larger-scale applications, NaCl was selected due to its low-cost availability and ease of handling.

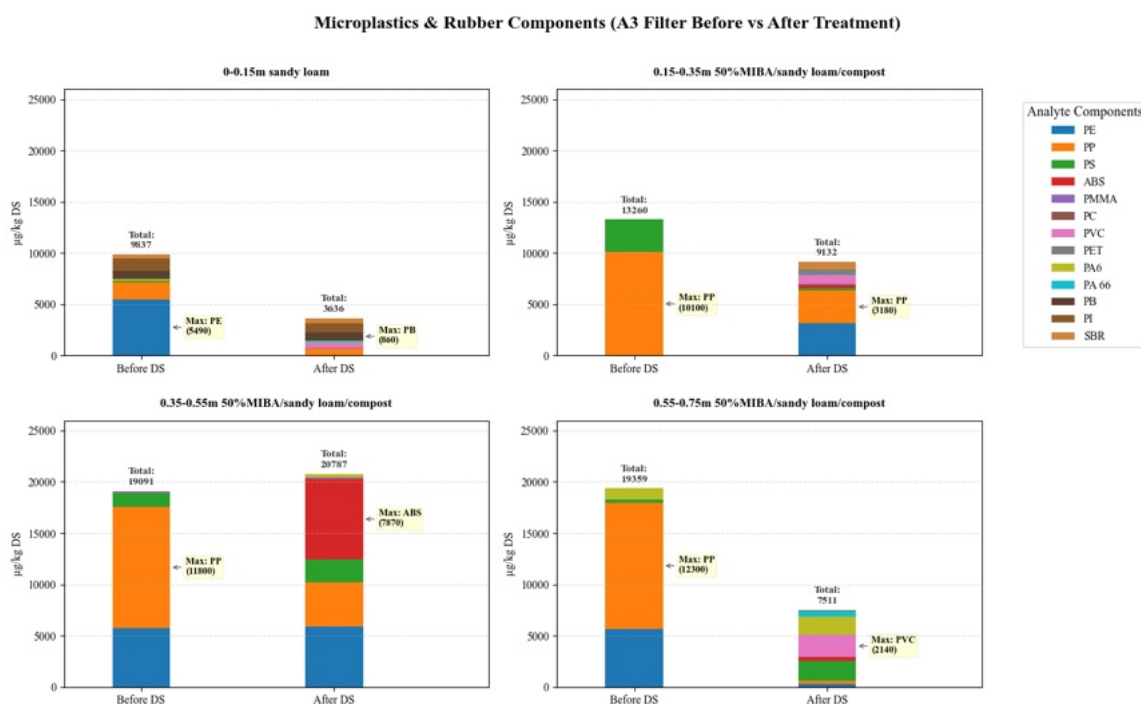


Figure 13 Comparison of MP contents in the ash A3 filter before and after density separation (DS).

In the biochar B3 filter, MPs were only quantified in the top layer after treatment, while contents in deeper layers remained below the LoQ, see Figure 14. Unlike the ash A3 filter, where total polymer contents generally decreased after treatment, no clear reduction trend was observed in B3. In the top layer, several polymers showed increased contents after treatment, such as PP, PVC, and PMMA, resulting in an overall increase in total polymer contents. For rubber polymers, PI and PB decreased, whereas SBR increased, resulting in a slight overall decrease in the total rubber content.

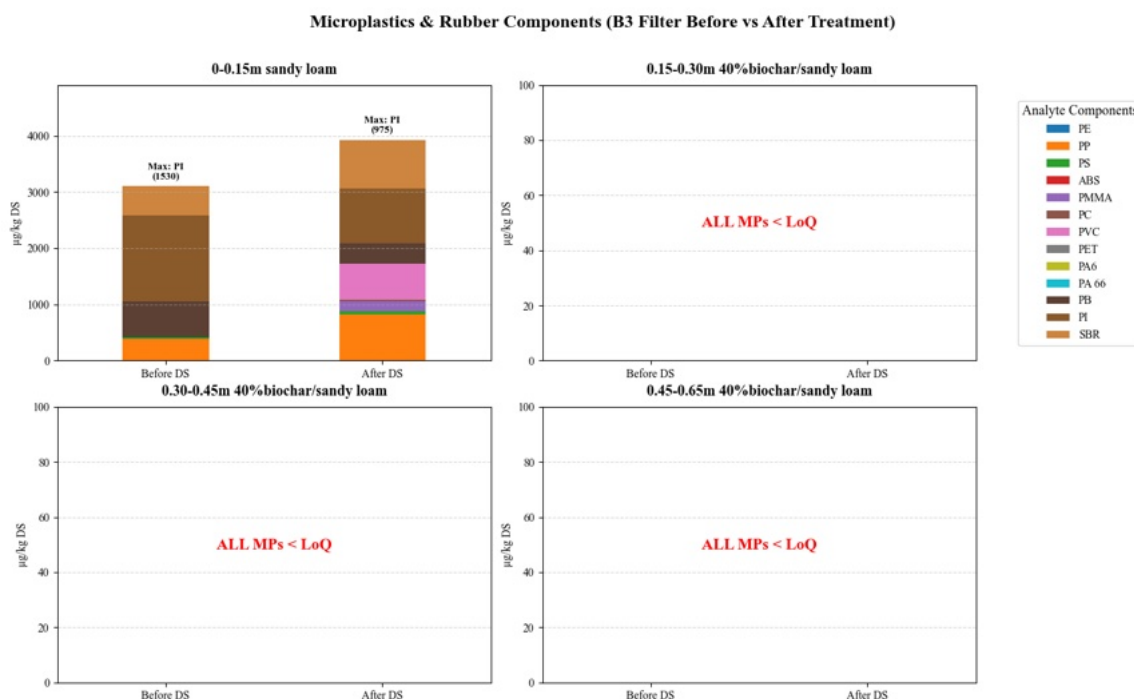


Figure 14 Comparison of MP contents in the biochar B3 filter before and after density separation (DS). Only the sandy loam 0-0.15 m had content > LoQ.

A saturated NaCl solution was used in this study due to its ability to separate low-density MPs from soil and sediment matrices. Previous studies have shown that NaCl can effectively recover low-density polymers such as PP and PE, with recovery rates up to 90% reported for sandy matrices (Schütze et al., 2022). Since PP and PE are among the most frequently reported polymers in urban stormwater environments (Liu et al., 2019), density separation using NaCl was expected to remove these polymers in the treated materials. Overall, the results suggest that this method can partially remove certain low-density polymers from the used filter materials, but the effectiveness appears to vary considerably depending on polymer types and different matrices.

After density separation, polymer contents in the sandy loam top layer become more comparable between A3 and B3 than in the untreated samples (Figure 15), as discussed in Section 4.1.2, although slightly higher values were observed in B3. Rubber contents were at similar levels in both filters, and no universal trend could be identified following density separation. While certain polymers showed substantial increases after treatment, others remained relatively unchanged or even increased. Similar patterns were also observed in the untreated materials, particularly for the B3 filter, where MPs were rarely <LoQ in deeper layers. These inconsistencies suggest that analysis of MPs in complex matrices such as biochar, MIBA, and soil materials is strongly influenced by methodological and analytical limitations. Density separation using NaCl may partially reduce matrix interference and disrupted particle aggregates, thereby improving the quantification of certain MPs during the analytical procedure. Consequently, the absence of MPs in the untreated samples does not necessarily indicate the complete absence of MPs in the materials.

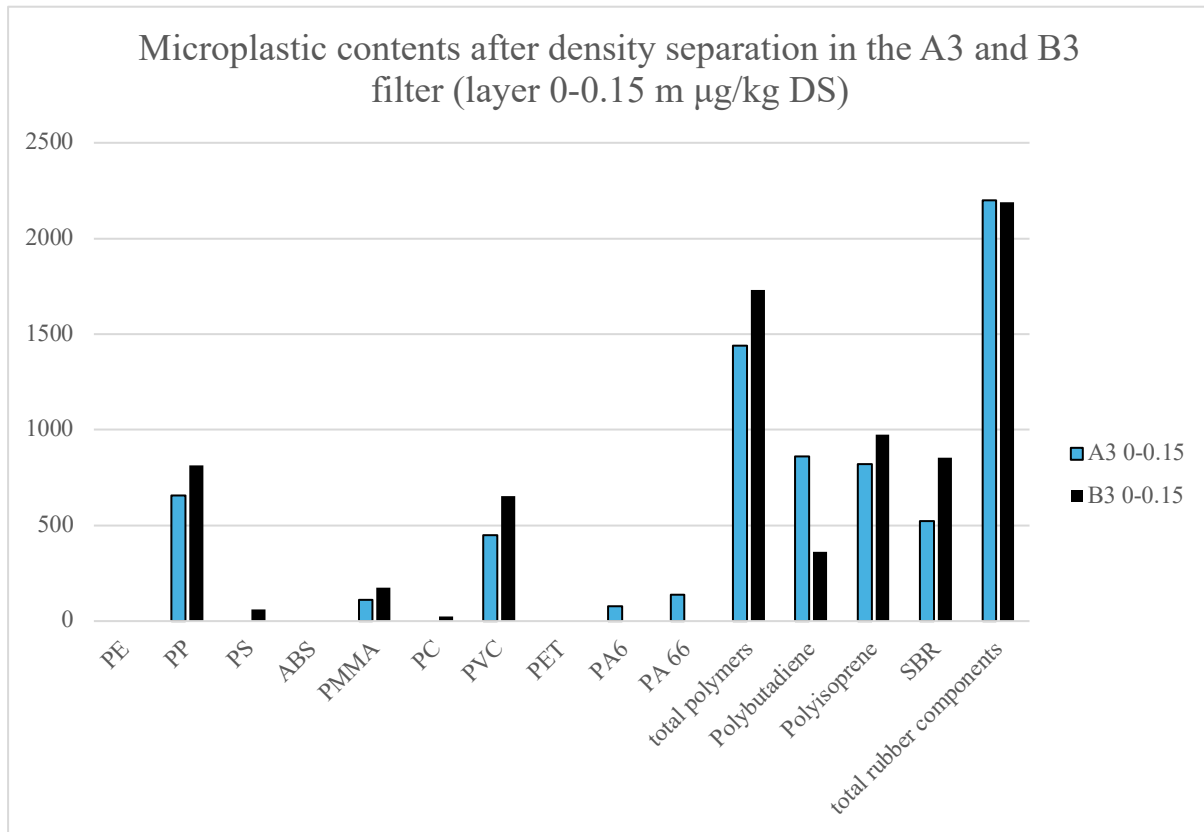


Figure 15 Comparison of MPs contents in the sandy loam 0–0.15 m layer of the ash A3 and biochar B3 filter, after density separation with NaCl. Layer 0–0.15 m contains 100% sandy loam in both filters.

4.2.2 Acid leaching combined with density separation

Density separation, as discussed in 4.2.1, was conducted on three ash A3 filter layers (0.15–0.35 m, 0.35–0.55 m, 0.55–0.75 m), with a mixture of sandy loam/MIBA/compost. To study the opportunity to also recover metals from the ash, these layers were exposed to acid leaching in different combinations, see Section 3.5 for details. The metal contents in the different ash layers i.e. 0.15–0.35 m, 0.35–0.55 m, 0.55–0.75 m, are discussed in Section 4.1.3. From a metal recovery perspective, Cu, Pb, and Zn are most interesting due to their higher contents (compared to As, Cd, Co, and Ni) and potential value (compared to Cr). Consequently, the discussion below focuses on Cu, Pb, and Zn. The complete results are presented in Appendix 6.

4.2.2.1 Density separation → Acid leaching

The first set of acid leaching tests was done on the three ash layers that had previously been exposed to density separation. Metal concentrations in the leachate are presented in Figure 16. Zinc and Cu showed the highest concentrations in the leachate, with Zn ranging from 259 to 480 mg/L and Cu ranging from 100 to 247 mg/L. This is consistent with their higher contents in the used materials. Lead showed concentrations ranging from 24 to 40 mg/L, while other metals generally were below 10 mg/L. To evaluate metal mobility, leaching efficiencies were calculated by comparing metal concentrations in the leachates with metal contents in the corresponding used materials, see Figure 17. The term "used materials" here refers to the filter

materials excavated from the bioretention filter after operation. Across all layers, Zn showed the highest leaching efficiency, ranging from 28% to 63%, while Cu and Pb showed similar efficiencies, ranging from 20% to 40%. A clear trend was observed among the three layers sandy loam/MIBA/compost: the 0.35–0.55 m layer showed lower leaching efficiency compared with the other layers. As discussed earlier for the ash A3 filter, higher metal contents were observed in the layer 0.35–0.55 m. Metal released from the 0.15–0.35 m sandy loam layer and/or introduced through stormwater appeared to migrate into the 0.35–0.55 m layer, which could initially suggest relatively high metal mobility within this layer. However, the lowest leaching efficiency was observed, indicating that these metals are more stable in this layer.

Sequential extraction of the 0.35–0.55 m layer showed that around 65% of Cd, 60% of Zn, 40% of Pb, and 30% of Cu were associated with adsorbed and exchangeable fractions, and carbonates (Figure 11). Zinc showed the highest concentrations in the leachate, which aligns with its relatively high proportion in mobile fractions. High leachability of Cd and Zn could be expected, but this is not clearly reflected in Cd concentrations in the leachate. Again, as we discussed in Section 4.1.5, that sequential extraction is conducted under controlled conditions, and its procedures involve strong chemicals and intensive shaking, whereas acid leaching in our study is exposed to less aggressive conditions. A high proportion of metals in exchangeable fractions does not directly and necessarily result in high metal leaching during the filter operation and acid leaching. The results of sequential extraction should be indicative rather than predictive. Since sequential extraction was only conducted for the 0.35–0.55 m layer, further comparison of metal speciation and mobility between layers was not possible.

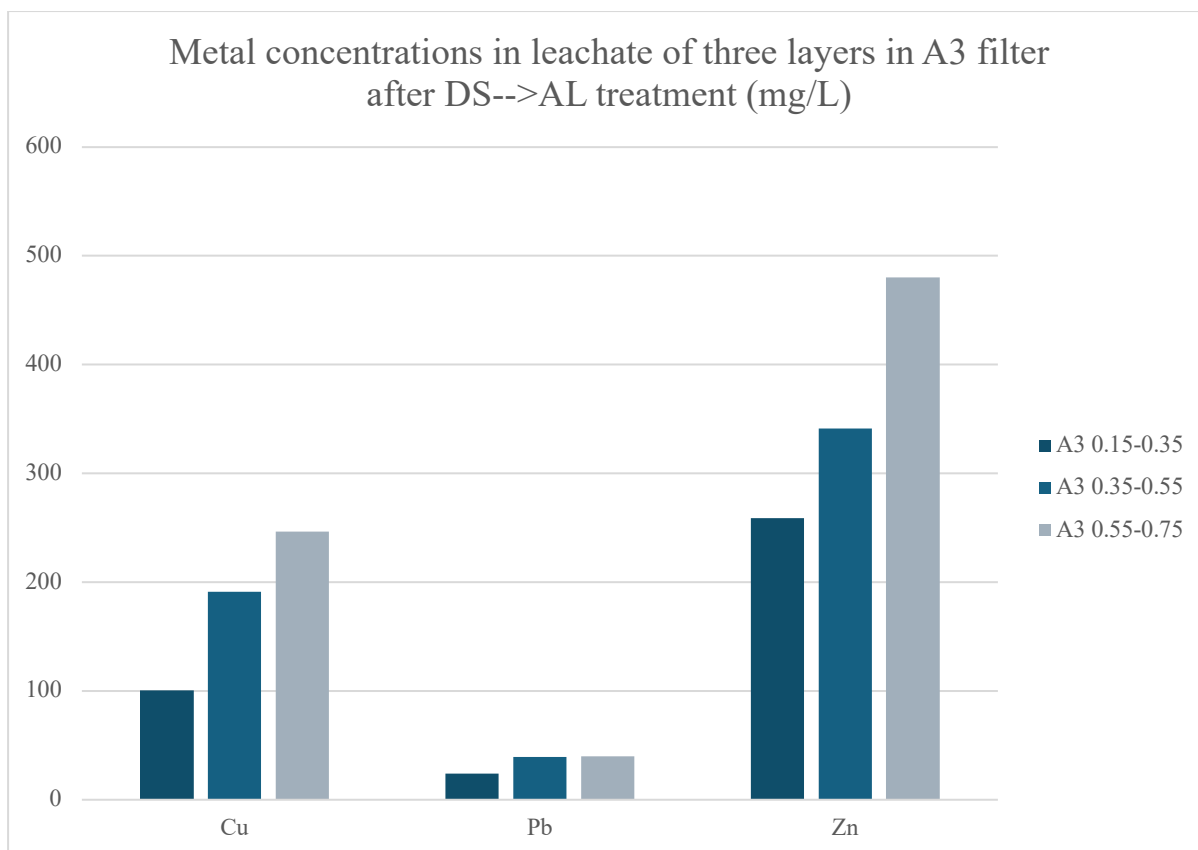


Figure 16 Metal concentrations in the leachate of the three different layers in the ash A3 filter. "DS—>AL"=density separation prior to acid leaching. All three layers contain 50% MIBA, 35% sandy loam, and 15% compost.

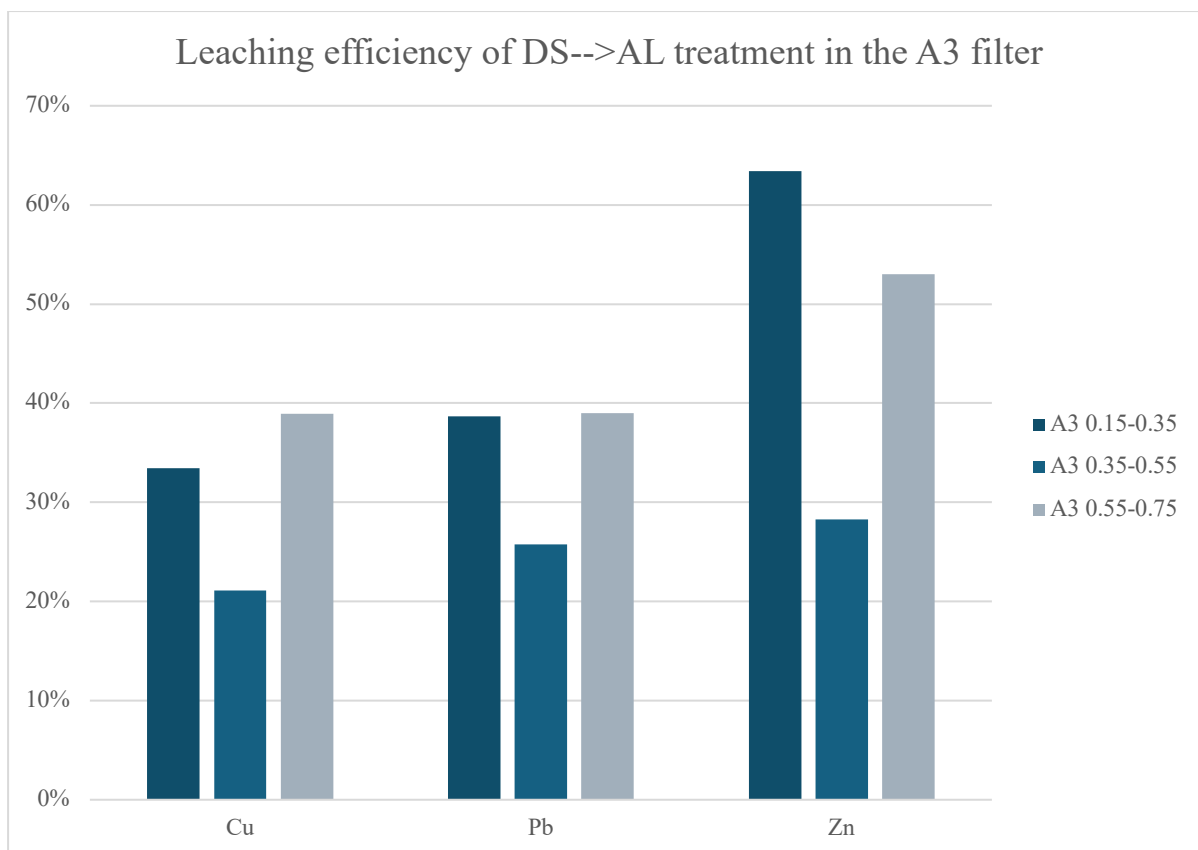


Figure 17 Metal leaching efficiency of the three different layers in the A3 filter. "DS-->AL"=density separation prior to acid leaching. All three layers contain 50% MIBA, 35% sandy loam, and 15% compost.

Comparison of three treatment sequences in layer A3 0.35–0.55 m

The 0.35–0.55 m sandy loam/MIBA/compost layer was selected to evaluate leaching performance under three different treatment sequences, as this layer contains higher metal contents and metals in this layer were initially expected to be more mobile, see Figure 18 and Figure 19. The treatment sequences included: acid leaching followed by density separation (AL-->DS), density separation followed by acid leaching (DS-->AL), and simultaneous density separation and acid leaching (DS+AL). See Section 3 for more details.

An obvious difference is observed between the three treatment sequences, where DS+AL is the overall best procedure, Figure 18. For Zn and Pb, a consistent trend is identified: DS+AL results in the highest leached concentrations and leaching efficiencies, followed by DS-->AL and then AL-->DS. For Cu, DS-->AL had slightly higher values than AL-->DS and DS+AL. A reason for the lower mobility in the AL-->DS sequence is that the leachates were collected after acid leaching but before density separation and were therefore not influenced by NaCl. This sequence shows the lowest leaching efficiency. One possible explanation is that the presence of NaCl during density separation enhanced metal mobilization and subsequent leaching. This observation is consistent with previous studies investigating the influence of deicing salts on metal mobility. Bäckström et al. (2004) reported that concentrations of Cd, Cu, Pb, and Zn in soil solutions were strongly related to the use of deicing agents (e.g., NaCl). Li et al. (2015) also observed elevated Cd and Pb concentrations in NaCl leachates. Possible mobilization

mechanisms include ion exchange, chloride complex formation, lowered pH and colloid dispersion (Bäckström et al., 2004; Flanagan et al., 2019). In the present study, pH was tested before and after treatment using pH paper. It showed no clear differences before and after NaCl treatment, with leachates remaining highly acidic (around pH 1).

A reason for the lower mobility in the DS→AL sequence can be found in the sequential extraction results, which showed that around 60% of Zn, 40% of Pb, and 30% of Cu were associated with the absorbed and exchangeable fractions, and carbonates. These fractions are generally considered mobile and can potentially be released by water. In the DS→AL sequence, density separation was conducted prior to acid leaching, which may have allowed part of the adsorbed and exchangeable metals and carbonates to be removed before the acid leaching stage. Therefore, these metals would not have been included in the subsequent leachate analysis. In contrast, in the DS+AL and AL→DS sequences, metal mobilized during the treatment remained within the analyzed solutions. The higher leaching efficiency observed in the DS+AL treatment may therefore be related to both enhanced metal mobilization in the presence of NaCl and to the retention of mobilized metals within the analyzed leachate phase.

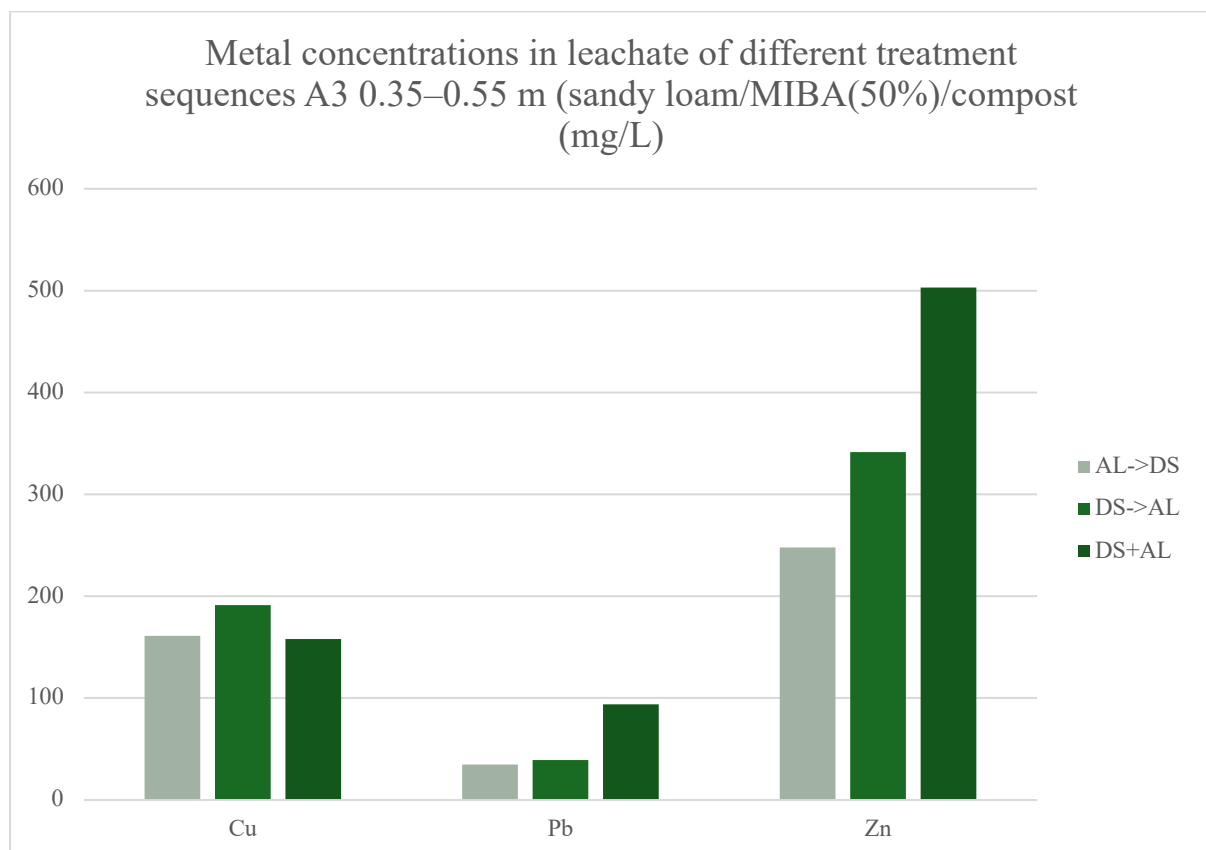


Figure 18 Metal concentration in the leachate of three different treatments, performed on the 0.35–0.55 m layer. "AL→DS"= acid leaching prior to density separation, "DS→AL"=density separation prior to acid leaching, "DS+AL"=density separation together with acid leaching.

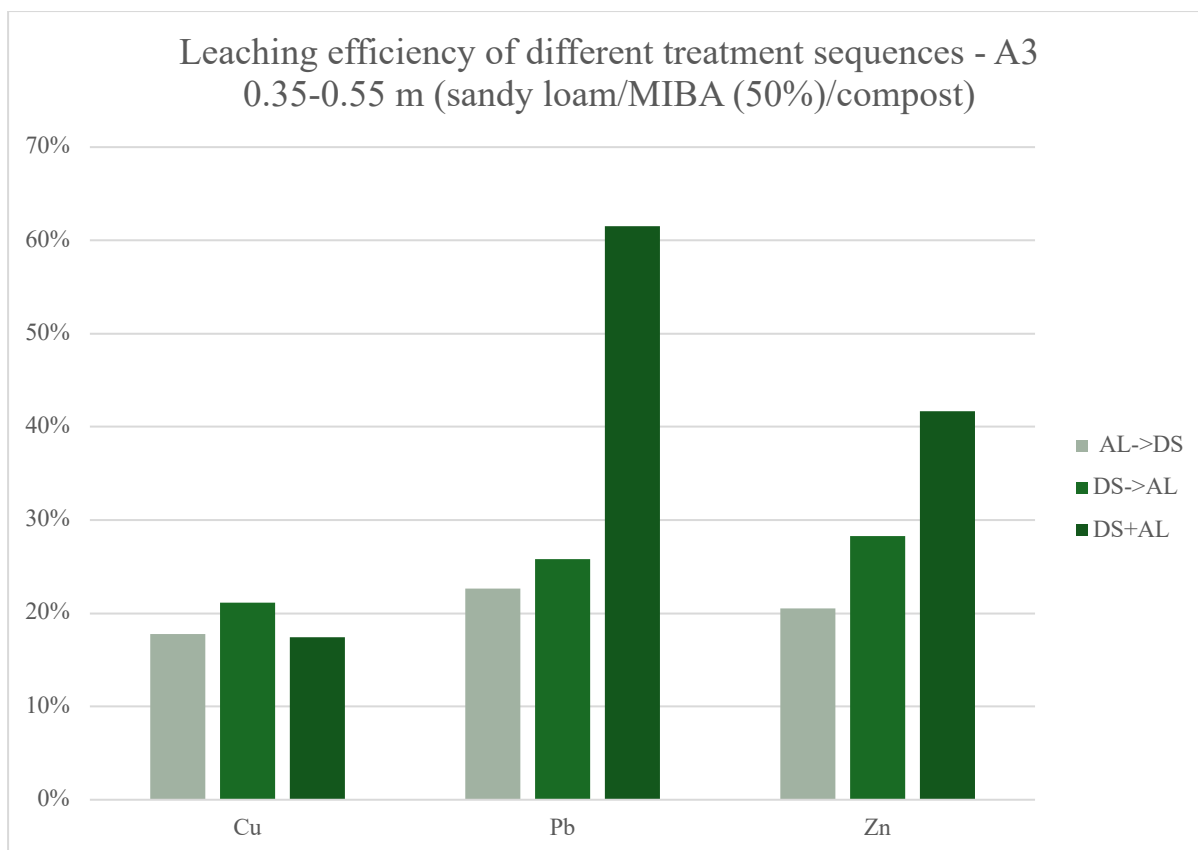


Figure 19 Metal leaching efficiency in the leachate of three different treatments, performed on the 0.35–0.55 m layer. "AL→DS"= acid leaching prior to density separation, "DS→AL"=density separation prior to acid leaching, "DS+AL"=density separation together with acid leaching.

Given that the DS+AL sequence has better leaching performance, metal concentrations in the original materials, used materials, and treated materials (after DS+AL) were compared to evaluate the overall treatment effect and potential for materials reuse. For Cu and Zn, concentrations in the treated materials are comparable to those in the original materials, while Pb shows lower concentrations after treatment, see Figure 20. This indicates that the treatment process can potentially restore the material to a condition suitable for reuse, but a significant decrease in metal content is less likely. This treatment sequence showed the best overall performance among the investigated treatment methods for metal mobilization. Its performance in MP removal remains uncertain, since MP analyses were not conducted on the treated materials. Compared with the sequential treatment approach (DS→AL and AL→DS), simultaneous treatment may also be simpler in operation and reduce water consumption.

However, despite the initial assumption that metals in the 0.35–0.55 m sandy loam/MIBA/compost layer would be more mobile, the relatively low leaching efficiency suggests that metals in this layer are more stably bound. In contrast, the 0.55–0.75 m sandy loam/MIBA/compost layer, which exhibits both high metal concentrations and higher leaching efficiency, may provide more favorable conditions for metal leaching and recovery. This could result in lower residual metal concentrations in treated materials compared to the original materials and is suggested to be further studied.

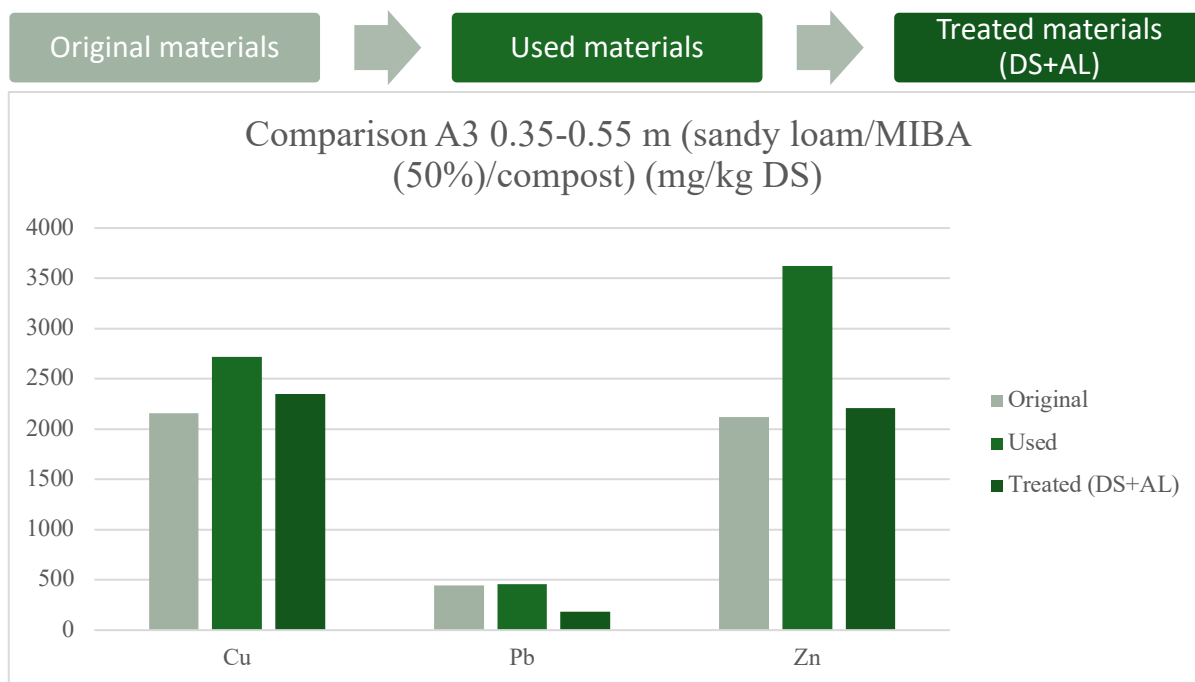


Figure 20 Metal contents in three different stages of treatment: "original" =original materials that are not used; "Used"=materials excavated after filter operation; "Treated"= used materials treated by density separation together with acid leaching.

5 Treatment Considerations for the Used Filter Materials

The results of this study showed that considerable amounts of metals and MPs accumulated in the used bioretention filter materials during operation, which is beneficial from a stormwater remediation perspective but highlights the need for appropriate and safe treatment of these materials. Elevated metal contents were observed in both filters and in many layers, particularly in the middle layer that contains MIBA materials in the ash A3 filter and in the surface layer of the biochar B3 filter. Several metals exceeded the Swedish guideline values for less sensitive land use (MKM) (Naturvårdsverkets Generella Riktvärden För Förorenad Mark (mg/kg DS), 2025), which were used in this study as reference values due to the absence of specific Swedish guideline values for the used bioretention filter materials. Sequential extraction further showed that a great proportion of some metals, such as Zn, Pb, and Cu, were associated with adsorbed and exchangeable metals, and carbonates. This suggests that these metals may remain potentially mobile and could be released under changing environmental conditions if the materials are improperly managed. Also, high contents of PP, PE, PS, and traffic-related rubber components were found in the used materials. Microplastics may pose long-term environmental risks due to their persistence, potential uptake by organisms, and their ability to act as vectors for metals and OPs (Yu et al., 2019), which may further complicate the disposal and reuse of contaminated filter materials.

Currently, post-treatment strategies for contaminated bioretention materials are rarely reported in the literature. Several studies have reported that pollutants tend to accumulate in the upper layers of bioretention filters and have recommended replacing these layers every 5–10 years, but information on the further management of the removed materials remains limited. In general, filter materials should first be tested for contaminant concentration, leachability, and toxicity. Based on the results and local regulations, materials may require management as contaminated or potentially hazardous waste. Possible management pathways may include landfilling, regeneration by thermal or chemical treatment, or reuse as construction materials (Eliche-Quesada et al., 2012; Pan et al., 2017; Watson et al., 2022).

This chapter, therefore, explores an integrated and sustainable post-treatment pathway for used bioretention filter materials, aiming not only to remove or degrade accumulated OPs and MPs, but also to recover valuable metals. Based on materials composition, the used filter materials can be broadly categorized into inorganic materials (e.g., soils and MIBA) and organic materials (e.g., biochar, peat, and plants). Considering the different properties of these materials, separate post-treatment strategies are proposed and discussed in the following sections.

5.1 Organic Materials

Organic materials in these filters include vegetation, pure biochar layers, and *Sphagnum* peat layers. In the present study, only the biochar layer was investigated. As discussed previously, biochar acted as a sink and accumulated great amounts of metals, particularly Zn, Cu, Pb and Ni. These accumulated metals may be considered potential secondary resources. Traffic-related

metals such as Cu, Zn, Pb and Ni are valuable industrial resources with increasing global demand (Elshkaki et al., 2018; Tominc et al., 2023).

Incineration may represent a feasible post-treatment option for these organic materials due to their relatively high combustible contents (Sabbas et al., 2003). Incineration is typically conducted at temperatures of approximately 800–1200 °C under aerobic conditions and can reduce waste volume by up to 90% while enabling energy recovery in waste-to-energy (WtE) plants (Bruno et al., 2021; Chen et al., 2014). Simultaneously, it reduces the volume of organic materials, degrades OPs and most MPs, and concentrates metals in the resulting ash (Kovacs et al., 2013), thereby facilitating the subsequent metal recovery. Previous studies have shown that metal recovery from waste materials, such as energy-from-waste ash, can have both environmental (e.g., reduced CO₂ emission) and economic (e.g., expense reduction) benefits compared to landfilling (Bakalár et al., 2021; Boesch et al., 2014; Fedje et al., 2014). Following incineration, metals can potentially be recovered from metal-enriched ash fractions. Such ash has been described as a bio-ore for metal recovery (Karlfeldt Fedje et al., 2021). Hydrometallurgy can be applied for metal extraction from fly ash. For example, in Switzerland, municipal solid waste incineration fly ash is commonly treated using the acidic FLUWA process, achieving metal recovery rates ranging from 30% to 91% (Weibel et al., 2021). Similarly, studies in Sweden have reported Zn recovery rates of up to 70% using acidic leaching and chemical precipitation combined with re-incineration of the washed fly ash to produce less toxic bottom ash (Karlfeldt Fedje & Andersson, 2020).

Despite these potential advantages, incineration also presents limitations and environmental compromises. Waste incineration contributes to greenhouse gas emissions and requires substantial energy input and controlled operating conditions (Sabbas et al., 2003). Although previous life cycle assessment (LCA) studies have suggested that incineration combined with energy and metal recovery may provide environmental benefits compared with landfilling (Boesch et al., 2014), LCA studies specifically addressing combined incineration and metal recovery from contaminated solid waste remain limited. Further research is needed to evaluate the long-term environmental and economic performance of such treatment pathways.

5.2 Inorganic Materials

Inorganic materials in these filters mainly include sandy loam from the surface layers and the middle adsorbent layers, where MIBA and biochar are mixed with sandy loam. Since the biochar in these layers was mixed directly with sandy loam, separation of the biochar from the sandy matrices could be difficult and likely impractical. These mixed middle layers were considered together as inorganic materials in this study. These materials accumulated considerable amounts of traffic-related metals and MPs during operation. Direct disposal of contaminated filter material may be technically simple, but large material volumes may make landfilling economically and environmentally unfavorable.

Based on the experimental results obtained in this study, density separation combined with acid leaching (DS+AL) is proposed as a potentially suitable post-treatment approach for inorganic

materials. In this study, HCl was selected as the leaching agent due to its relatively low cost, availability as a common industrial byproduct, and good metal recovery performance. Zinc leaching efficiencies reached up to around 60% under the tested conditions. Although precipitation and downstream metal recovery processes were not included experimentally in this study, previous studies have demonstrated the feasibility of recovering metals from metal-enriched leachates. Various leaching agents, including inorganic agents, organic agents, surfactants, and compound chemical agents (Dermont et al., 2008), have been investigated for mobilizing metals from contaminated soil or MIBA matrices into the liquid phase, enabling metal recovery. For example, Meng et al. (2017) used humic substance to wash Cd-contaminated soil and precipitated Cd from the leachate, while Fedje and Strömvall (2019) employed acidic industrial wastewater followed by chemical precipitation to recover Cu from contaminated soils. Hydrometallurgical treatment processes also involved limitations. Acid leaching requires large chemical consumption and generates secondary wastewater that requires further treatment. More sustainable hydrometallurgical approaches have been proposed in recent years. For example, the concept of circular hydrometallurgy introduced by Binnemans & Jones (2023) emphasizes principles such as reagent regeneration, waste prevention, and improved energy efficiency throughout the recovery process. These principles may provide valuable references for future development and optimization.

Saturated NaCl solutions were applied in this study during density separation for MP removal. Although no consistent overall trend in MP removal efficiency could be identified due to analytical limitations, NaCl showed the ability to separate certain MPs from complex soil matrices. Density separation could also be applied to the pure biochar layer. However, due to the low density of biochar, it tends to float on the solution surface, reducing the effectiveness of the separation process. In practice, incineration may be a more feasible way for managing MP-contaminated biochar. As discussed earlier, NaCl may also contribute to enhanced metal mobilization through mechanisms such as ion exchange and chloride formation, thereby potentially improving metal leaching efficiency. One drawback of NaCl-based treatment is the generation of saline solid residues. Additional washing steps may be needed to reduce salt contents before final disposal, although insufficient washing could still limit the subsequent reuse of options and necessitate landfilling.

5.3 Future Study

In addition to studies about MP detection in complex matrices and post-management of bioretention filters, future research is also recommended on:

- How different treatment pathways influence MP removal and metal recovery efficiency.
- Pilot-scale validation of the proposed treatment pathways to evaluate their technical feasibility under more realistic operational conditions.
- Life cycle assessment and economic analyses are recommended to evaluate the environmental impacts, resource efficiency, and economic feasibility of the proposed treatment pathways. Energy consumption, chemical use, and handling of saline residues should be included.

6 Conclusion

This study investigated the accumulation, distribution, and characteristics of metals and MPs in used bioretention filter materials from two column systems containing different adsorbent materials. Treatment strategies for pollutant removal and potential resource recovery were evaluated and discussed. The conclusions corresponding to the research questions are summarized below.

- RQ1: How are metals and MPs distributed along different layers of the bioretention filters, and what are their characteristics including metal particle size fraction and MP types?

The results showed clear differences in pollutant distribution patterns between the MIBA-based (A3) and biochar-based (B3) bioretention filters. In the B3 filter, metal contents generally decreased with depth, suggesting that metals originated from stormwater inflow and accumulated in the upper filter layers. The ash A3 filter showed elevated metal contents throughout the filter profile, suggesting that metals originated from stormwater and were also released from MIBA and redistributed within the middle MIBA layers. Sequential extraction further showed that Cd and Zn were relatively mobile, whereas Cr and Ni were mainly associated with stable fractions. For both filters, although the finest particle fraction generally showed the highest metal contents, most of the metal load was associated with larger particle fractions due to their greater mass contribution.

Microplastics and rubber particles were detected in both filters. The dominant polymer types identified were consistent with those commonly reported in urban stormwater environments, including PE, PP, PB, PI, and SBR. Microplastics analyses showed considerable variability, particularly in complex matrices such as biochar and MIBA. The reported MP contents should be interpreted as indicative rather than absolute values.

- RQ2: How can residual MPs be effectively separated from soil and sorbent materials in the used bioretention filter?

The results showed that density separation using saturated NaCl solution could partially separate certain low-density MPs, such as PP and PE, from the investigated filter materials. Rubber particles were less affected by the treatment. No consistent removal trend was observed across all polymers and filter layers. Microplastics separation and/or detection were strongly influenced by the complex composition of the filter materials, particle aggregation, and analytical limitations. The saline residues resulting from density separation may require extra washing to remove the salt.

- RQ3: Is it possible to develop a method that effectively separates MPs and at the same time, recovers valuable metals from soil from the bioretention filter?

The investigated filter materials were divided into organic and inorganic fractions. For organic materials, incineration appears to be a promising management method, as MPs can be degraded through the process and metals may potentially be recovered from the resulting ash. For the inorganic materials, the results showed that combined MP separation and metal recovery from used bioretention filter materials is technically possible. Acid leaching using HCl showed high

metal leaching efficiency. Density separation using NaCl may contribute not only to MP separation but also to enhanced metal mobilization.

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Appendix 1

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Ordernummer : LE2507531 Version 1
Kund : Chalmers Tekniska Högskola



Analysresultat

Provbeteckning B3_1.1 0-0.15
Laboratoriets provnummer LE2507531-001
Provtagningsdatum / tid 2025-05-05
Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	63100	± 8810	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	15200	± 1900	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	19300	± 2970	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	21700	± 2620	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4120	± 544	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	544	± 72	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23100	± 3480	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	504	± 68	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	354000	± 46700	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2000	± 273	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	582	± 119	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	3.16	± 0.48	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.109	± 0.025	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	5.17	± 0.71	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	66.9	± 8.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	22.2	± 4.0	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0159	± 0.0047	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	12.7	± 1.7	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	11.3	± 1.7	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	18.5	± 4.0	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	586	± 83	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.65	± 1.06	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	239	± 38	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.1	± 4.7	mg/kg TS	2.00	S-SFMS-49	LE
W, wolfram	4.29	± 0.68	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	24.0	± 3.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	85.3	± 11.3	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	128	± 21	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	5.81	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	99.4 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	74.2	± 2.0	%	1.0	S-DW105	LE

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 Ordnummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_1.2 0-0.15**
 Laboratoriets provnummer **LE2507531-002**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	59700	± 8340	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	14500	± 1810	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	17600	± 2700	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20100	± 2430	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4010	± 530	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	481	± 64	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21700	± 3270	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	477	± 64	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	319000	± 42100	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2100	± 286	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	530	± 108	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.27	± 0.35	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.178	± 0.030	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.53	± 0.62	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	42.1	± 5.8	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	32.2	± 5.7	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0155	± 0.0047	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	13.2	± 1.7	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.61	± 1.17	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	18.1	± 3.9	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	294	± 46	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.53	± 1.04	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	226	± 35	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	33.7	± 4.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	2.87	± 0.46	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	23.7	± 3.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	79.0	± 10.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	126	± 21	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	6.63	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	90.6 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	75.7	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_1.3 0-0.15**
 Laboratoriets provnummer **LE2507531-003**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	63100	± 8820	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	16400	± 2050	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	18500	± 2840	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	19600	± 2370	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3780	± 500	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	554	± 73	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	22700	± 3410	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	561	± 76	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	319000	± 42100	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2090	± 285	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	543	± 111	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.37	± 0.36	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.104	± 0.025	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.53	± 0.62	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	50.3	± 6.8	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	18.7	± 3.3	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0166	± 0.0048	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	19.0	± 2.5	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.50	± 1.15	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	17.1	± 3.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	236	± 39	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	7.59	± 1.21	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	236	± 37	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	30.7	± 4.0	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	3.69	± 0.59	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	32.6	± 4.4	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	94.5	± 12.5	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	162	± 27	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	5.57	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	91.6 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	75.0	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_2.1 0.15-0.30**
 Laboratoriets provnummer **LE2507531-004**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	62800	± 8780	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	16400	± 2050	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	18400	± 2820	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	19600	± 2370	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4030	± 533	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	595	± 79	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23200	± 3490	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	496	± 67	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	312000	± 41200	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2140	± 292	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	505	± 103	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.51	± 0.39	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0916	± 0.0238	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	5.24	± 0.72	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	41.2	± 5.7	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	15.8	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0107	± 0.0041	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	16.9	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	8.56	± 1.31	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	14.7	± 3.2	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	170	± 32	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.99	± 0.96	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	251	± 39	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	34.6	± 4.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	3.00	± 0.48	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	26.8	± 3.6	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	68.2	± 9.0	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	166	± 27	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	12.1	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	90.2 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	72.3	± 2.0	%	1.0	S-DW105	LE

Sida : 6 av 27
 Ordnummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.1 0.30-0.45**
 Laboratoriets provnummer **LE2507531-005**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	60700	± 8490	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	16300	± 2030	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	18200	± 2800	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20100	± 2430	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3930	± 519	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	599	± 79	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	22500	± 3390	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	479	± 65	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	312000	± 41300	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2120	± 289	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	502	± 102	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.77	± 0.42	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0890	± 0.0237	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.01	± 0.55	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	41.5	± 5.7	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	16.6	± 3.0	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	17.7	± 2.3	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.03	± 1.08	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	15.7	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	152	± 31	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.02	± 0.80	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	224	± 35	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	30.0	± 3.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	2.14	± 0.34	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	30.3	± 4.0	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	67.1	± 8.9	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	134	± 22	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	11.1	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	89.8 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	68.0	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.2 0.30-0.45**
 Laboratoriets provnummer **LE2507531-006**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	60800	± 8500	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	14900	± 1870	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	16400	± 2520	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	17900	± 2160	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3060	± 404	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	586	± 77	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23200	± 3490	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	412	± 56	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	307000	± 40600	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	1820	± 248	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	500	± 102	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.35	± 0.36	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0883	± 0.0236	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.62	± 0.50	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	98.1	± 12.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.6	± 2.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	18.2	± 2.4	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	6.53	± 1.02	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	12.6	± 2.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	150	± 30	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	4.85	± 0.78	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	220	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	27.7	± 3.6	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	2.41	± 0.39	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	28.5	± 3.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	65.8	± 8.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	208	± 34	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	12.4	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	88.0 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	63.6	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.3 0.30-0.45**
 Laboratoriets provnummer **LE2507531-007**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	61100	± 8540	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	15400	± 1920	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	17800	± 2730	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	19000	± 2290	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3690	± 488	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	636	± 84	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	22600	± 3400	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	405	± 55	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	312000	± 41200	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	1940	± 265	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	501	± 102	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.43	± 0.37	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.101	± 0.024	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.39	± 0.47	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	38.0	± 5.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	15.4	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	18.1	± 2.3	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	5.90	± 0.93	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	13.0	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	150	± 30	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	8.22	± 1.31	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	219	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	26.8	± 3.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	2.86	± 0.46	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	27.7	± 3.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	65.7	± 8.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	189	± 31	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	17.1	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	89.3 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	71.2	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_4.1 0.45-0.65**
 Laboratoriets provnummer **LE2507531-008**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	58700	± 8210	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	15500	± 1940	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	16900	± 2600	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20500	± 2480	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4050	± 536	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	551	± 73	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21400	± 3220	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	426	± 58	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	302000	± 39900	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2170	± 296	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	577	± 118	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.37	± 0.37	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0727	± 0.0228	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.90	± 0.54	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	27.2	± 4.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	12.3	± 2.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	14.4	± 1.9	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.77	± 1.19	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	12.4	± 2.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	133	± 29	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.61	± 0.90	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	227	± 36	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	29.6	± 3.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.88	± 0.30	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	23.4	± 3.1	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	67.2	± 8.9	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	150	± 25	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	16.3	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	86.8 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	65.3	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3B_1.1 0.65-0.75**
 Laboratoriets provnummer **LE2507531-009**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	5720	± 800	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	4240	± 532	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	3220	± 494	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	2660	± 322	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	1100	± 146	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	419	± 55	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	2640	± 397	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	197	± 27	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	30400	± 4020	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	205	± 28	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	87.1	± 17.8	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	<0.5	----	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	0.687	± 0.100	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	10.4	± 2.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	7.85	± 1.41	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	3.16	± 0.56	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	1.94	± 0.42	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	<100	----	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	29.8	± 4.8	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	4.21	± 0.56	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.74	± 0.28	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	2.60	± 0.35	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	19.6	± 2.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	30.1	± 4.9	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	89.0	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	9.60 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	30.4	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3R_1.1 0-0.15**
 Laboratoriets provnummer **LE2507531-010**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	64900	± 9070	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	17100	± 2140	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	20600	± 3160	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20400	± 2470	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	5970	± 789	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	579	± 77	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23200	± 3490	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	563	± 76	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	328000	± 43400	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2170	± 296	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	534	± 109	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	3.22	± 0.49	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.122	± 0.026	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.08	± 0.83	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	59.9	± 8.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	18.9	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0117	± 0.0042	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	14.5	± 1.9	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	11.5	± 1.7	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.0	± 4.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	218	± 37	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.55	± 1.05	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	235	± 37	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	41.2	± 5.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	3.66	± 0.58	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	27.5	± 3.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	93.2	± 12.3	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	155	± 25	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.69	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	94.9 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	83.2	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3R_2.1 0.15-0.30**
 Laboratoriets provnummer **LE2507531-011**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	57400	± 8020	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	15500	± 1940	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	18800	± 2880	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	18900	± 2290	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3930	± 519	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	600	± 79	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21200	± 3190	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	482	± 65	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	311000	± 41000	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2110	± 288	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	508	± 103	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.86	± 0.44	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0905	± 0.0238	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.59	± 0.49	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	45.4	± 6.2	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	16.4	± 2.9	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0123	± 0.0043	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	18.0	± 2.3	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	6.96	± 1.08	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	14.4	± 3.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	201	± 35	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	7.35	± 1.17	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	216	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	34.7	± 4.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	2.24	± 0.36	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	28.1	± 3.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	73.4	± 9.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	231	± 38	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	18.2	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	88.4 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	65.1	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3R_3.1 0.30-0.45**
 Laboratoriets provnummer **LE2507531-012**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	52800	± 7370	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	13200	± 1650	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	16300	± 2500	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	16600	± 2010	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3960	± 523	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	516	± 68	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	19600	± 2950	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	386	± 52	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	251000	± 33200	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	1640	± 224	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	468	± 95	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.43	± 0.23	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0804	± 0.0232	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.74	± 0.51	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	21.0	± 3.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.6	± 2.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	13.6	± 1.8	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.63	± 1.17	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	13.2	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	135	± 29	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.57	± 1.05	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	195	± 31	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	26.6	± 3.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.24	± 0.20	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	22.3	± 3.0	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	57.8	± 7.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	155	± 25	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	22.1	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	73.7 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	62.7	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning A3_1.2 0-0.15
 Laboratoriets provnummer LE2507531-013
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	68300	± 9550	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	21400	± 2670	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	27800	± 4270	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20300	± 2460	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	6680	± 883	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	799	± 106	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23400	± 3520	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	905	± 122	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	319000	± 42100	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	3790	± 516	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	556	± 113	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	3.20	± 0.49	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.114	± 0.025	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.08	± 0.97	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	50.6	± 6.8	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	27.4	± 4.9	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0167	± 0.0049	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	20.8	± 2.7	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	9.62	± 1.46	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	18.3	± 3.9	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	323	± 49	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	11.4	± 1.8	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	265	± 42	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	55.5	± 7.3	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.43	± 0.87	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	35.6	± 4.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	126	± 17	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	228	± 37	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	5.35	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	95.7 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	74.7	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning A3_1.3 0-0.15
 Laboratoriets provnummer LE2507531-014
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	68100	± 9510	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	18900	± 2360	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	22500	± 3450	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	23000	± 2780	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4860	± 642	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	640	± 85	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23100	± 3480	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	600	± 81	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	333000	± 44000	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2690	± 367	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	672	± 137	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.66	± 0.26	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.178	± 0.031	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.06	± 0.97	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	49.9	± 6.7	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	117	± 21	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	17.2	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	18.4	± 2.8	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	40.0	± 8.6	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	294	± 46	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	7.87	± 1.26	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	20.0	± 3.2	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	244	± 38	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	41.6	± 5.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.51	± 0.88	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	29.0	± 3.9	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	233	± 31	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	177	± 29	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.86	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	97.4 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	80.3	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning A3_2.1 0.15-0.35
 Laboratoriets provnummer LE2507531-017
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	57800	± 8080	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	30600	± 3820	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	21600	± 3310	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	17400	± 2110	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	5320	± 702	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	609	± 81	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21300	± 3200	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	1280	± 171	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	285000	± 37700	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	3330	± 454	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	6.29	± 1.30	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	724	± 147	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.81	± 0.28	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.419	± 0.056	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	16.1	± 2.2	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	198	± 26	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	870	± 155	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0137	± 0.0045	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	14.1	± 1.8	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	78.9	± 11.7	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	104	± 22	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	508	± 73	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	7.18	± 1.15	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	243	± 38	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	58.2	± 7.6	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	4.18	± 0.67	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	24.0	± 3.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	1240	± 164	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	184	± 30	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	5.62	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	86.0 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	77.5	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning A3_3.1 0.35-0.55
 Laboratoriets provnummer LE2507531-018
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	63000	± 8800	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	90400	± 11300	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	57500	± 8820	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	13900	± 1680	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	10300	± 1370	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	954	± 126	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	26500	± 3980	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	3070	± 412	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	254000	± 33500	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	6370	± 869	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	25.3	± 5.2	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	3680	± 749	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	3.32	± 0.50	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	1.29	± 0.16	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	30.7	± 4.2	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	373	± 49	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	3140	± 559	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0273	± 0.0066	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	14.7	± 2.3	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	13.1	± 1.7	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	184	± 27	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	324	± 70	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	2040	± 278	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	4.39	± 0.70	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	119	± 19	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	394	± 62	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	48.2	± 6.3	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	20.8	± 3.3	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	23.7	± 3.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	3940	± 521	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	195	± 32	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	6.83	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	95.9 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	79.4	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning A3_3.2 0.35-0.55
 Laboratoriets provnummer LE2507531-019
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	66600	± 9300	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	66800	± 8340	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	38000	± 5830	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	17800	± 2150	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	9130	± 1210	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	857	± 113	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21800	± 3290	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	2760	± 371	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	280000	± 37000	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	4710	± 642	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	18.0	± 3.7	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	1160	± 237	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.84	± 0.29	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	1.44	± 0.18	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	26.5	± 3.6	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	346	± 45	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	2140	± 380	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0241	± 0.0060	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	8.46	± 1.33	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	12.2	± 1.6	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	128	± 19	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	322	± 69	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1200	± 165	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	7.29	± 1.16	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	101	± 16	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	335	± 53	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	60.1	± 7.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	17.5	± 2.8	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	23.9	± 3.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	2430	± 321	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	184	± 30	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.04	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	95.5 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	79.9	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning A3_3.3 0.35-0.55
 Laboratoriets provnummer LE2507531-020
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	69800	± 9750	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	78000	± 9740	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	48200	± 7400	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	15700	± 1900	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	12400	± 1640	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	1150	± 152	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23500	± 3530	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	3200	± 429	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	265000	± 35000	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	6320	± 862	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	17.7	± 3.6	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	1500	± 306	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.58	± 0.40	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	1.10	± 0.14	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	35.7	± 4.9	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	477	± 62	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	3050	± 543	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0175	± 0.0050	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	14.2	± 2.2	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	17.3	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	234	± 35	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	710	± 152	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1360	± 187	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.88	± 1.10	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	65.4	± 10.6	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	335	± 53	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	54.7	± 7.2	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	10.4	± 1.7	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	27.0	± 3.6	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	3910	± 516	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	225	± 37	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.42	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	96.6 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	78.8	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **A3B_1.1 0.75-0.80**
 Laboratoriets provnummer **LE2507531-022**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	9710	± 1360	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	27800	± 3470	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	10400	± 1600	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	2640	± 320	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	2640	± 350	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	445	± 59	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	3540	± 533	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	514	± 69	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	34700	± 4590	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	1160	± 158	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	279	± 57	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	<0.5	----	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.171	± 0.030	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.93	± 0.68	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	36.3	± 5.1	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	270	± 48	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0112	± 0.0042	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	42.0	± 6.2	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	42.3	± 9.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	630	± 89	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	88.7	± 13.9	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	10.0	± 1.3	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	4.75	± 0.76	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	2.96	± 0.40	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	1240	± 163	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	47.1	± 7.7	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	76.3	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	16.3 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	28.4	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3_4.1 0.55-0.75
 Laboratoriets provnummer LE2507531-021
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	59400	± 8300	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	80400	± 10000	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	55400	± 8490	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	15700	± 1900	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	9500	± 1260	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	1100	± 145	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	25300	± 3800	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	3200	± 430	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	254000	± 33500	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	5570	± 759	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	18.3	± 3.7	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	2880	± 588	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.83	± 0.29	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	1.77	± 0.22	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	27.0	± 3.7	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	666	± 87	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	1900	± 338	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0250	± 0.0062	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	10.0	± 1.6	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	15.4	± 2.0	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	135	± 20	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	305	± 65	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1490	± 203	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.91	± 1.10	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	55.0	± 8.9	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	322	± 51	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	61.9	± 8.1	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	13.9	± 2.2	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	25.7	± 3.4	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	2720	± 359	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	179	± 29	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.51	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	93.3 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	80.4	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3P_1.1 0.80-0.81
 Laboratoriets provnummer LE2507531-023
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	3020	± 422	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	34600	± 4320	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	1920	± 295	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	1710	± 208	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	2040	± 270	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	78.2	± 10.5	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	2540	± 383	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	303	± 41	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	18600	± 2460	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	129	± 18	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	56.9	± 11.6	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	<0.5	----	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.05	S-SFMS-16	LE
Co, kobolt	1.18	± 0.17	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	11.6	± 2.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	66.7	± 11.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0224	± 0.0057	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	44.7	± 7.0	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.3	± 1.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	4.25	± 0.91	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1290	± 176	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	82.4	± 13.0	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	7.67	± 1.01	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	16.2	± 2.6	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	0.894	± 0.130	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	105	± 14	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	23.9	± 3.9	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	88.5	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	10.7 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	17.7	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3R_1.1 0-0.15
 Laboratoriets provnummer LE2507531-024
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	63200	± 8830	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	16300	± 2040	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	19400	± 2980	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	19600	± 2370	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	3830	± 507	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	613	± 81	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23600	± 3550	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	483	± 65	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	308000	± 40700	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	1930	± 264	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	513	± 105	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.79	± 0.28	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.169	± 0.030	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.91	± 0.67	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	55.2	± 7.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	53.6	± 9.5	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0122	± 0.0043	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	15.7	± 2.0	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	8.89	± 1.35	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	17.2	± 3.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	345	± 52	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.73	± 0.92	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	229	± 36	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	34.6	± 4.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	4.12	± 0.66	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	32.0	± 4.3	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	128	± 17	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	168	± 28	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.30	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	89.6 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	75.7	± 2.0	%	1.0	S-DW105	LE

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 Ordnummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning **A3R_3.1 0.35-0.55**
 Laboratoriets provnummer **LE2507531-026**
 Provtagningsdatum / tid **2025-05-05**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	66500	± 9290	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	80700	± 10100	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	45600	± 6990	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	14800	± 1790	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	14800	± 1950	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	1010	± 134	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	22600	± 3410	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	2910	± 391	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	252000	± 33300	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	6480	± 883	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	20.4	± 4.2	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	1530	± 313	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.48	± 0.38	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	1.14	± 0.14	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	42.9	± 5.9	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	1310	± 170	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	2550	± 453	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0217	± 0.0056	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	12.6	± 2.0	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	16.6	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	178	± 26	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	482	± 104	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1420	± 194	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.15	± 0.82	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	67.8	± 10.9	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	350	± 55	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	53.1	± 6.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	14.9	± 2.4	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	21.3	± 2.9	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	4210	± 557	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	167	± 27	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	8.44	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	93.5 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	79.2	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2507531 Version 1
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3R_2.1 0.15-0.35
 Laboratoriets provnummer LE2507531-025
 Provtagningsdatum / tid 2025-05-05
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
MG-2						
Al, aluminium	67000	± 9370	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	35600	± 4450	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	26000	± 3990	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	19600	± 2360	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	6010	± 795	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	656	± 87	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	23500	± 3530	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	1310	± 175	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	316000	± 41700	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	3670	± 501	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	6.96	± 1.44	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	983	± 200	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.88	± 0.44	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.422	± 0.056	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	13.5	± 1.9	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	109	± 14	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	932	± 166	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0140	± 0.0045	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	15.3	± 2.0	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	50.8	± 7.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	266	± 57	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	593	± 84	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.08	± 0.97	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	34.0	± 5.5	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	269	± 42	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	41.6	± 5.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.04	± 0.80	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	28.1	± 3.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	1210	± 160	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	235	± 39	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	5.41	± 5.00	% TS	0.100	S-LOI1000	LE
Summa oxider	96.5 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	81.4	± 2.0	%	1.0	S-DW105	LE

Appendix 2

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Analysresultat

Provbeteckning B3_1.1 <20 0.0-0.15
 Laboratoriets provnummer LE2522062-001
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	65100	± 9100	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	18800	± 2350	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	36800	± 5650	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	20900	± 2530	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	6100	± 806	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	846	± 112	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	21100	± 3170	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	991	± 133	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	278000	± 36700	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	3280	± 448	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	517	± 105	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.68	± 0.41	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.288	± 0.041	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	10.6	± 1.5	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	111	± 15	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	48.4	± 8.6	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0729	± 0.0153	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	33.7	± 4.4	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	17.4	± 2.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	25.5	± 5.5	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	681	± 95	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	10.5	± 1.7	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	194	± 30	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	50.7	± 6.6	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	15.7	± 2.5	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	49.0	± 6.5	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	236	± 31	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	480	± 79	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	11.7	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.2	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_1.2 <20 0.0-0.15**
 Laboratoriets provnummer **LE2522062-002**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	65700	± 9180	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18900	± 2360	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	36800	± 5650	mg/kg	0.004	S-SFMS-49	LE
K, kalium	20600	± 2490	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	6170	± 815	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	840	± 111	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	20900	± 3150	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	1020	± 137	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	285000	± 37700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3280	± 447	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	3.02	± 0.66	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	528	± 107	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	3.00	± 0.46	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.268	± 0.039	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	9.89	± 1.35	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	116	± 15	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	47.8	± 8.5	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0474	± 0.0103	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	32.8	± 4.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	16.2	± 2.4	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	25.9	± 5.6	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	579	± 82	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	10.5	± 1.7	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	196	± 31	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	52.1	± 6.8	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	16.0	± 2.5	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	48.5	± 6.5	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	230	± 31	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	472	± 77	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	11.7	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.9	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_1.1 20-125 0.0-0.15
 Laboratoriets provnummer LE2522062-003
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	56300	± 7860	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18300	± 2280	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	26500	± 4060	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19800	± 2390	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	5240	± 693	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	568	± 75	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17300	± 2610	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	913	± 123	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	297000	± 39200	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3160	± 431	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	469	± 96	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.97	± 0.31	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.132	± 0.027	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.49	± 1.03	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	114	± 15	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	25.5	± 4.5	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0252	± 0.0062	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	16.4	± 2.1	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	11.0	± 1.7	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.9	± 4.3	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	325	± 50	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.34	± 1.49	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	204	± 32	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	57.6	± 7.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.77	± 0.92	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	33.8	± 4.5	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	109	± 14	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	573	± 94	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.65	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.9	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_1.2 20-125 0.0-0.15
 Laboratoriets provnummer LE2522062-004
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	56300	± 7870	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18500	± 2310	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	26800	± 4120	mg/kg	0.004	S-SFMS-49	LE
K, kalium	20700	± 2500	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	5200	± 687	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	585	± 77	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17500	± 2630	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	889	± 119	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	312000	± 41200	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3300	± 450	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	484	± 99	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.08	± 0.32	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.138	± 0.027	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.54	± 1.03	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	89.6	± 11.8	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	25.7	± 4.6	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0353	± 0.0080	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	16.9	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.7	± 1.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.7	± 4.2	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	298	± 46	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.82	± 1.57	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	214	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	57.5	± 7.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.96	± 0.95	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	35.6	± 4.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	112	± 15	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	545	± 89	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.90	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.0	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_1.3 20-125 0.0-0.15
 Laboratoriets provnummer LE2522062-005
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	58200	± 8130	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18600	± 2330	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	27500	± 4220	mg/kg	0.004	S-SFMS-49	LE
K, kalium	20600	± 2490	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	5460	± 722	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	618	± 82	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	18400	± 2770	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	896	± 120	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	313000	± 41400	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3300	± 449	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	491	± 100	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.19	± 0.34	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.148	± 0.028	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.19	± 0.99	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	94.7	± 12.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	24.5	± 4.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0278	± 0.0067	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	17.1	± 2.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.7	± 1.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.8	± 4.3	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	287	± 45	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	10.0	± 1.6	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	215	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	57.3	± 7.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	5.75	± 0.92	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	36.3	± 4.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	107	± 14	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	635	± 104	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	7.74	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.0	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_1.1 125-500 0.0-0.15
 Laboratoriets provnummer LE2522062-006
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	52200	± 7300	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	12800	± 1600	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	15200	± 2330	mg/kg	0.004	S-SFMS-49	LE
K, kalium	18600	± 2240	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3400	± 449	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	314	± 42	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17900	± 2690	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	383	± 52	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	312000	± 41200	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1580	± 216	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	432	± 88	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.66	± 0.26	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0680	± 0.0226	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.93	± 0.68	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	31.0	± 4.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	16.2	± 2.9	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	8.13	± 1.06	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	8.32	± 1.27	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	15.3	± 3.3	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	166	± 32	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.27	± 0.84	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	198	± 31	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	29.8	± 3.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.94	± 0.31	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	16.3	± 2.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	62.6	± 8.3	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	112	± 18	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.18	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.1	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_1.2 125-500 0.0-0.15
 Laboratoriets provnummer LE2522062-007
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	54800	± 7660	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	13100	± 1640	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	15500	± 2370	mg/kg	0.004	S-SFMS-49	LE
K, kalium	18900	± 2280	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3530	± 466	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	301	± 40	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	18700	± 2810	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	391	± 53	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	331000	± 43700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1550	± 212	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	440	± 90	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.60	± 0.26	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0618	± 0.0223	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.87	± 0.67	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	36.0	± 5.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	15.1	± 2.7	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0100	± 0.0040	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	7.34	± 0.96	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	8.26	± 1.26	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	15.6	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	164	± 32	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.47	± 0.88	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	204	± 32	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	32.1	± 4.2	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.71	± 0.28	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	15.0	± 2.0	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	61.0	± 8.1	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	151	± 25	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.19	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.0	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_2.1 <20 0.15-0.30
 Laboratoriets provnummer LE2522062-008
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	59600	± 8330	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	16700	± 2080	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	31400	± 4820	mg/kg	0.004	S-SFMS-49	LE
K, kalium	17500	± 2120	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4640	± 613	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	822	± 109	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	20200	± 3050	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	916	± 123	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	255000	± 33700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2730	± 372	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	3.07	± 0.67	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	468	± 95	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.78	± 0.43	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.209	± 0.033	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.25	± 0.99	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	86.8	± 11.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	36.8	± 6.6	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0447	± 0.0098	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	32.3	± 4.2	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	14.7	± 2.2	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	21.8	± 4.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	363	± 54	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.34	± 1.49	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	186	± 29	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.2	± 4.7	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	3.28	± 0.52	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	44.0	± 5.9	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	153	± 20	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	453	± 74	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	18.8	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.1	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_2.2 <20 0.15-0.30**
 Laboratoriets provnummer **LE2522062-009**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	59700	± 8340	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	16900	± 2110	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	31600	± 4850	mg/kg	0.004	S-SFMS-49	LE
K, kalium	17500	± 2110	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4670	± 618	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	831	± 110	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	20300	± 3050	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	913	± 123	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	252000	± 33300	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2750	± 374	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	3.10	± 0.67	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	468	± 95	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.60	± 0.40	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.201	± 0.033	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.31	± 1.00	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	88.0	± 11.6	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	35.2	± 6.3	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0354	± 0.0080	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	31.9	± 4.1	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	14.1	± 2.1	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	22.0	± 4.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	388	± 57	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.26	± 1.48	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	183	± 29	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	37.4	± 4.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	3.68	± 0.59	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	43.5	± 5.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	156	± 21	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	457	± 75	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	18.8	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.0	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_2.1 20-125 0.15-0.30
 Laboratoriets provnummer LE2522062-010
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	55100	± 7710	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	17900	± 2230	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	25500	± 3920	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19000	± 2290	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4700	± 621	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	579	± 76	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17500	± 2630	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	925	± 124	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	310000	± 41000	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3270	± 446	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	459	± 94	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.79	± 0.28	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.136	± 0.027	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.44	± 0.88	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	67.9	± 9.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	17.7	± 3.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0171	± 0.0049	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	17.7	± 2.3	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	9.68	± 1.47	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	18.4	± 3.9	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	228	± 38	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.60	± 1.53	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	204	± 32	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	54.7	± 7.2	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.44	± 0.23	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	35.1	± 4.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	74.4	± 9.9	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	655	± 107	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	8.93	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.8	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_2.2 20-125 0.15-0.30
 Laboratoriets provnummer LE2522062-011
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	54100	± 7560	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	17300	± 2160	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	25000	± 3840	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19100	± 2310	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4750	± 628	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	569	± 75	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17300	± 2600	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	872	± 117	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	299000	± 39500	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3080	± 420	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	450	± 92	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.76	± 0.28	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.126	± 0.026	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.19	± 0.85	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	63.1	± 8.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	19.1	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0196	± 0.0053	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	16.0	± 2.1	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.3	± 1.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	18.8	± 4.0	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	217	± 37	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.39	± 1.50	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	200	± 31	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	53.8	± 7.0	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.50	± 0.24	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	35.9	± 4.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	80.5	± 10.7	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	654	± 107	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	9.75	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.9	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_2.1 125-500 0.15-0.30
 Laboratoriets provnummer LE2522062-012
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	56900	± 7950	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	14300	± 1790	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	17100	± 2630	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19800	± 2390	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3820	± 505	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	375	± 50	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	19200	± 2900	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	514	± 69	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	341000	± 45000	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1910	± 260	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	465	± 95	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.90	± 0.30	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0905	± 0.0238	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	5.00	± 0.69	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	35.2	± 4.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.3	± 2.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0126	± 0.0043	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	9.87	± 1.28	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.95	± 1.22	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	15.7	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	176	± 33	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.23	± 1.00	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	212	± 33	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	34.9	± 4.6	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	20.4	± 2.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	53.1	± 7.1	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	145	± 24	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	6.23	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	95.9	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_2.2 125-500 0.15-0.30**
 Laboratoriets provnummer **LE2522062-013**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	56300	± 7860	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	13900	± 1740	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	17000	± 2600	mg/kg	0.004	S-SFMS-49	LE
K, kalium	20200	± 2440	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3850	± 509	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	361	± 48	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	19200	± 2890	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	518	± 70	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	327000	± 43200	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1760	± 240	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	461	± 94	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.84	± 0.29	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0763	± 0.0230	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.70	± 0.65	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	46.4	± 6.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.4	± 2.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0124	± 0.0043	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	9.20	± 1.19	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.17	± 1.11	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	15.8	± 3.4	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	175	± 33	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	6.19	± 0.99	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	209	± 33	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.0	± 4.7	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	20.0	± 2.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	54.6	± 7.3	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	156	± 26	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	6.38	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	95.5	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.1 <20 0.30-0.45**
 Laboratoriets provnummer **LE2522062-014**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	57900	± 8100	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	16800	± 2100	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	31700	± 4870	mg/kg	0.004	S-SFMS-49	LE
K, kalium	17000	± 2060	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4850	± 642	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	855	± 113	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	19400	± 2920	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	928	± 125	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	248000	± 32700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2650	± 361	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	458	± 93	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.58	± 0.40	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.206	± 0.033	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.12	± 0.98	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	74.8	± 9.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	29.5	± 5.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0292	± 0.0069	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	30.9	± 4.0	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	14.1	± 2.1	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.9	± 4.3	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	345	± 52	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.19	± 1.47	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	177	± 28	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.0	± 4.7	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.48	± 0.24	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	42.5	± 5.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	133	± 18	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	423	± 69	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	24.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.7	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.2 <20 0.30-0.45**
 Laboratoriets provnummer **LE2522062-015**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	58900	± 8230	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	16900	± 2120	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	32100	± 4920	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	17600	± 2130	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4840	± 640	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	871	± 115	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	19700	± 2970	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	863	± 116	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	245000	± 32400	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2760	± 377	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	485	± 99	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.58	± 0.40	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.194	± 0.032	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.71	± 0.92	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	78.3	± 10.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	29.3	± 5.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0277	± 0.0066	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	31.3	± 4.0	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	13.4	± 2.0	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.5	± 4.2	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	348	± 52	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.29	± 1.48	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	178	± 28	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	37.1	± 4.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.65	± 0.27	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	42.8	± 5.7	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	135	± 18	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	431	± 71	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	24.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.6	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.3 <20 0.30-0.45**
 Laboratoriets provnummer **LE2522062-016**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	49900	± 6970	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	14700	± 1840	mg/kg TS	0.01	S-SFMS-49	LE
Fe, järn	27500	± 4220	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	15600	± 1890	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	4130	± 546	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	737	± 97	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	17200	± 2580	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	692	± 93	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	204000	± 27000	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	2320	± 316	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	427	± 87	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.09	± 0.32	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.188	± 0.031	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.90	± 0.95	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	63.9	± 8.5	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	30.2	± 5.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0375	± 0.0084	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	27.2	± 3.5	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	13.7	± 2.1	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.5	± 4.2	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	349	± 53	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	8.00	± 1.28	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	164	± 26	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	32.5	± 4.3	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.46	± 0.24	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	38.4	± 5.1	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	134	± 18	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	387	± 63	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	24.2	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.5	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_3.1 20-125 0.30-0.45
 Laboratoriets provnummer LE2522062-017
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	53500	± 7480	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18100	± 2260	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	24700	± 3790	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19600	± 2370	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4790	± 633	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	567	± 75	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17200	± 2600	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	799	± 107	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	286000	± 37800	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3210	± 438	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	486	± 99	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.78	± 0.28	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.130	± 0.027	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.64	± 0.91	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	72.5	± 9.6	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	16.7	± 3.0	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0158	± 0.0047	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	15.9	± 2.1	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.0	± 1.5	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	17.8	± 3.8	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	235	± 39	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.42	± 1.50	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	215	± 34	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	52.4	± 6.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	31.5	± 4.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	71.3	± 9.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	604	± 99	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	10.7	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.9	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_3.2 20-125 0.30-0.45
 Laboratoriets provnummer LE2522062-018
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	50300	± 7030	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	16300	± 2040	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	23000	± 3540	mg/kg	0.004	S-SFMS-49	LE
K, kalium	18100	± 2190	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4500	± 595	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	527	± 70	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	16000	± 2400	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	804	± 108	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	270000	± 35700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2930	± 399	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	439	± 90	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.62	± 0.26	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.124	± 0.026	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.44	± 0.88	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	53.6	± 7.2	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	16.9	± 3.0	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0182	± 0.0051	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	14.9	± 1.9	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	11.2	± 1.7	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	17.4	± 3.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	239	± 40	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	8.67	± 1.38	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	195	± 31	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	48.7	± 6.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	31.7	± 4.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	66.6	± 8.8	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	511	± 84	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	10.7	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.8	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_3.1 125-500 0.30-0.45
 Laboratoriets provnummer LE2522062-019
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	57400	± 8020	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	14400	± 1800	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	13900	± 2130	mg/kg	0.004	S-SFMS-49	LE
K, kalium	21300	± 2580	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3540	± 468	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	311	± 41	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	21400	± 3220	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	351	± 47	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	309000	± 40800	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1510	± 206	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	518	± 106	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.86	± 0.29	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0536	± 0.0220	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.88	± 0.53	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	30.4	± 4.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	9.65	± 1.73	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	5.40	± 0.71	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	6.38	± 0.99	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	14.4	± 3.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	107	± 27	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.09	± 0.81	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	233	± 37	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	30.7	± 4.0	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	16.0	± 2.1	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	33.2	± 4.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	74.4	± 12.2	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.23	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.5	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_3.2 125-500 0.30-0.45**
 Laboratoriets provnummer **LE2522062-020**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	59600	± 8330	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	14800	± 1850	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	14200	± 2180	mg/kg	0.004	S-SFMS-49	LE
K, kalium	22100	± 2670	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3590	± 474	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	323	± 43	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	21700	± 3260	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	366	± 50	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	314000	± 41400	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1660	± 226	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	520	± 106	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.69	± 0.27	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0538	± 0.0220	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.96	± 0.54	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	25.3	± 3.8	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	10.2	± 1.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	6.04	± 0.79	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	6.03	± 0.94	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	13.9	± 3.0	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	119	± 28	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.25	± 0.84	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	236	± 37	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	32.6	± 4.3	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	16.2	± 2.2	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	34.1	± 4.6	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	93.2	± 15.3	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.63	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.5	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_4.1 <20 0.45-0.65
 Laboratoriets provnummer LE2522062-021
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	58500	± 8170	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18400	± 2300	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	30800	± 4720	mg/kg	0.004	S-SFMS-49	LE
K, kalium	17700	± 2140	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4880	± 645	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	900	± 119	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	21400	± 3220	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	819	± 110	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	225000	± 29700	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2720	± 371	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	484	± 99	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.48	± 0.38	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.199	± 0.032	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.98	± 0.96	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	75.9	± 10.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	28.4	± 5.1	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	29.2	± 3.8	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	13.6	± 2.1	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.2	± 4.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	366	± 55	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.39	± 1.50	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	184	± 29	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.5	± 4.8	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	1.17	± 0.19	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	43.2	± 5.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	135	± 18	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	325	± 53	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	20.8	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.5	± 2.0	%	1.0	S-DW105	LE

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Provbeteckning B3_4.2 <20 0.45-0.65
 Laboratoriets provnummer LE2522062-022
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	53000	± 7400	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	16300	± 2030	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	27500	± 4230	mg/kg	0.004	S-SFMS-49	LE
K, kalium	16300	± 1970	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4400	± 582	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	791	± 104	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	19400	± 2920	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	704	± 95	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	201000	± 26500	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2430	± 331	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	436	± 89	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.41	± 0.37	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.178	± 0.031	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	7.31	± 1.00	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	70.3	± 9.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	27.7	± 4.9	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	26.2	± 3.4	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	14.2	± 2.1	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.3	± 4.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	454	± 66	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	8.20	± 1.31	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	169	± 27	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	31.2	± 4.1	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	38.4	± 5.1	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	134	± 18	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	306	± 50	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	20.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	97.7	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_4.1 20-125 0.45-0.65
 Laboratoriets provnummer LE2522062-023
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	54200	± 7570	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18700	± 2330	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	22300	± 3420	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19700	± 2380	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	4990	± 660	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	566	± 75	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	18000	± 2710	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	799	± 107	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	259000	± 34200	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	3070	± 419	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	483	± 98	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.69	± 0.27	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.129	± 0.026	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.69	± 0.92	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	60.9	± 8.1	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	15.8	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	12.8	± 1.7	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	12.6	± 1.9	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	17.2	± 3.7	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	226	± 38	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	9.01	± 1.44	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	213	± 33	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	57.5	± 7.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	4.48	± 0.71	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	32.4	± 4.3	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	68.5	± 9.1	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	559	± 92	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	12.7	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.7	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_4.2 20-125 0.45-0.65
 Laboratoriets provnummer LE2522062-024
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	52900	± 7390	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	18200	± 2270	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	22000	± 3370	mg/kg	0.004	S-SFMS-49	LE
K, kalium	19300	± 2340	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	5050	± 668	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	558	± 74	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	17600	± 2650	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	777	± 104	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	263000	± 34800	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	2940	± 400	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	474	± 97	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.86	± 0.29	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.115	± 0.025	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	6.87	± 0.94	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	48.9	± 6.6	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	18.2	± 3.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	0.0131	± 0.0044	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	12.4	± 1.6	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	10.7	± 1.6	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	19.9	± 4.3	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	324	± 50	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	8.23	± 1.31	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	207	± 33	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	49.4	± 6.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	29.8	± 4.0	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	78.9	± 10.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	403	± 66	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	11.1	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.7	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_4.1 125-500 0.45-0.65
 Laboratoriets provnummer LE2522062-025
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	56500	± 7890	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	14700	± 1830	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	14200	± 2190	mg/kg	0.004	S-SFMS-49	LE
K, kalium	20900	± 2530	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3550	± 469	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	347	± 46	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	20300	± 3050	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	375	± 51	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	304000	± 40100	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1730	± 236	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	502	± 102	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	2.02	± 0.31	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0640	± 0.0224	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.52	± 0.62	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	46.0	± 6.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	11.7	± 2.1	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	6.74	± 0.88	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	9.03	± 1.37	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	14.3	± 3.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	120	± 28	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.64	± 0.90	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	230	± 36	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	34.2	± 4.5	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	17.4	± 2.3	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	39.5	± 5.3	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	78.2	± 12.8	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.05	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.4	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_4.2 125-500 0.45-0.65
 Laboratoriets provnummer LE2522062-026
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	55500	± 7760	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	14600	± 1820	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	14100	± 2160	mg/kg	0.004	S-SFMS-49	LE
K, kalium	21000	± 2540	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	3590	± 475	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	320	± 42	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	19900	± 3000	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	356	± 48	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	300000	± 39600	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1600	± 218	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	503	± 102	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.98	± 0.31	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	4.63	± 0.64	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	35.8	± 5.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	12.3	± 2.2	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	5.47	± 0.72	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	8.80	± 1.34	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	14.3	± 3.1	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	136	± 29	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	5.47	± 0.88	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	224	± 35	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	32.4	± 4.2	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	15.8	± 2.1	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	40.4	± 5.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	84.7	± 13.9	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	4.57	± 5.00	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.5	± 2.0	%	1.0	S-DW105	LE

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 Ordernummer : LE2522062
 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.1 <20 0.65-0.75
 Laboratoriets provnummer LE2522062-027
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	15600	± 2180	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	8190	± 1020	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	9130	± 1400	mg/kg	0.004	S-SFMS-49	LE
K, kalium	5490	± 664	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	2180	± 289	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	787	± 104	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	5440	± 818	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	609	± 82	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	51300	± 6780	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	817	± 111	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	180	± 37	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.607	± 0.128	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0665	± 0.0225	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.22	± 0.44	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	55.5	± 7.4	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	20.1	± 3.6	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	6.85	± 0.89	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	28.0	± 4.2	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	8.17	± 1.75	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	272	± 43	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.46	± 0.40	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	57.5	± 9.1	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	13.7	± 1.8	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	10.5	± 1.4	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	71.9	± 9.5	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	66.4	± 10.9	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	79.6	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	95.3	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning **B3_5.2 <20 0.65-0.75**
 Laboratoriets provnummer **LE2522062-028**
 Provtagningsdatum / tid **ej specificerad**
 Matris **JORD**

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	17000	± 2380	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	8470	± 1060	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	9810	± 1510	mg/kg	0.004	S-SFMS-49	LE
K, kalium	5900	± 714	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	2330	± 308	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	775	± 102	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	5640	± 849	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	611	± 82	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	54800	± 7230	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	864	± 118	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	189	± 39	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.728	± 0.141	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.00	± 0.41	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	59.5	± 8.0	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	19.6	± 3.5	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	7.07	± 0.92	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	26.0	± 3.9	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	8.11	± 1.74	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	297	± 46	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.30	± 0.37	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	58.6	± 9.2	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	15.6	± 2.1	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	11.3	± 1.5	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	69.7	± 9.2	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	67.0	± 11.0	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	79.3	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	95.3	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.1 20-125 0.65-0.75
 Laboratoriets provnummer LE2522062-029
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	20600	± 2880	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	10500	± 1310	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	8990	± 1380	mg/kg	0.004	S-SFMS-49	LE
K, kalium	7950	± 961	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	2610	± 346	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	593	± 78	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	6860	± 1030	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	629	± 85	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	94000	± 12400	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	1030	± 140	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	227	± 46	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.786	± 0.148	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.0570	± 0.0221	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	3.30	± 0.45	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	35.1	± 4.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.5	± 2.4	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	5.21	± 0.68	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	13.0	± 2.0	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	8.48	± 1.82	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	229	± 38	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	3.39	± 0.54	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	84.6	± 13.3	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	21.4	± 2.8	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	10.9	± 1.5	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	60.7	± 8.1	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	124	± 20	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	72.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	96.0	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.1 125-500 0.65-0.75
 Laboratoriets provnummer LE2522062-030
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	30300	± 4240	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	9840	± 1230	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	8840	± 1360	mg/kg	0.004	S-SFMS-49	LE
K, kalium	10900	± 1320	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	2240	± 297	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	389	± 51	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	10800	± 1630	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	348	± 47	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	148000	± 19600	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	824	± 112	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	283	± 58	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.960	± 0.169	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	2.67	± 0.37	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	29.7	± 4.3	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	10.5	± 1.9	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	1.51	± 0.31	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	6.92	± 1.07	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	7.87	± 1.69	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	109	± 27	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.61	± 0.42	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	122	± 19	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	18.5	± 2.4	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	19.1	± 2.6	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	33.8	± 4.5	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	47.8	± 7.8	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	48.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	99.0	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.2 125-500 0.65-0.75
 Laboratoriets provnummer LE2522062-031
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	23300	± 3250	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	8440	± 1060	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	7090	± 1090	mg/kg	0.004	S-SFMS-49	LE
K, kalium	8720	± 1050	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	1820	± 241	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	377	± 50	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	8370	± 1260	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	321	± 43	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	114000	± 15100	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	665	± 91	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	226	± 46	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.696	± 0.137	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	2.20	± 0.30	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	15.6	± 2.7	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	12.9	± 2.3	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.07	± 1.09	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	7.49	± 1.61	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	128	± 28	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.17	± 0.35	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	96.8	± 15.2	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	14.2	± 1.9	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	6.59	± 0.88	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	38.1	± 5.1	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	38.2	± 6.3	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	55.6	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.9	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.3 125-500 0.65-0.75
 Laboratoriets provnummer LE2522062-032
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	26100	± 3650	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	8760	± 1090	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	7720	± 1180	mg/kg	0.004	S-SFMS-49	LE
K, kalium	10300	± 1240	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	1990	± 263	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	383	± 51	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	9560	± 1440	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	329	± 45	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	131000	± 17300	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	785	± 107	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	246	± 50	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.768	± 0.146	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	2.62	± 0.36	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	16.9	± 2.9	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	15.5	± 2.8	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	7.14	± 1.10	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	8.64	± 1.86	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	175	± 33	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.25	± 0.36	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	103	± 16	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	15.0	± 2.0	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	8.12	± 1.09	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	41.8	± 5.6	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	36.3	± 5.9	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	52.4	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	98.3	± 2.0	%	1.0	S-DW105	LE

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 Kund : Chalmers Tekniska Högskola



Provbeteckning B3_5.2 20-125 0.65-0.75
 Laboratoriets provnummer LE2522062-033
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Nej	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	14500	± 2030	mg/kg	0.002	S-SFMS-49	LE
Ca, kalcium	8430	± 1050	mg/kg	0.01	S-SFMS-49	LE
Fe, järn	6850	± 1050	mg/kg	0.004	S-SFMS-49	LE
K, kalium	6180	± 748	mg/kg	0.004	S-SFMS-49	LE
Mg, magnesium	2140	± 283	mg/kg	0.002	S-SFMS-49	LE
Mn, mangan	564	± 74	mg/kg	0.0002	S-SFMS-49	LE
Na, natrium	5160	± 777	mg/kg	0.004	S-SFMS-49	LE
P, fosfor	543	± 73	mg/kg	0.001	S-SFMS-49	LE
Si, kisel	62300	± 8230	mg/kg	0.008	S-SFMS-49	LE
Ti, titan	814	± 111	mg/kg	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	<3	----	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	173	± 35	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	0.586	± 0.126	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	<0.05	----	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	2.77	± 0.38	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	23.9	± 3.6	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	13.8	± 2.5	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	<5	----	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	<5	----	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	12.4	± 1.9	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	7.38	± 1.58	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	213	± 37	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	2.25	± 0.36	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	<20	----	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	60.4	± 9.5	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	16.3	± 2.1	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	<1	----	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	7.28	± 0.97	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	55.5	± 7.4	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	44.5	± 7.3	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	70.3	± 5.0	% TS	0.100	S-LOI1000	LE
Torrsubstans vid 105°C	96.4	± 2.0	%	1.0	S-DW105	LE

Appendix 3



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AR-26-MX-004704-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur:
Analyseperiode: 02.02.2026 14:00 -
02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-118	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3 0.0-0.15	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	6.28				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Tørr prøvemengde for mikroplast	65	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0	µg/kg TS	5		Intern metode
* Polypropylene (PP)	379	µg/kg TS	8		Intern metode
* Polystyren (PS)	31.7	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	<50.0	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	<2.0	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	411	µg/kg TS			Intern metode
* Gummpartikkel-komponenter >10 µm					
* Polybutadiene	646	µg/kg TS	20		Intern metode
* Polyisoprene	1530	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	522	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	2700	µg/kg TS			Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Målesikkerhet <: Mindre enn >: Større enn
nd: Not detected/ ikke påvist Bakteriologiske resultater angitt som <1,-<50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Målesikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om målesikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v200



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AR-26-MX-004705-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur:
Analyseperiode: 02.02.2026 14:00 -
02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-119	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3 0,15-0,30	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	29.87				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Tørr prøvemengde for mikroplast	50	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0	µg/kg TS	5		Intern metode
* Polypropylene (PP)	<8.0	µg/kg TS	8		Intern metode
* Polystyren (PS)	<2.0	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	<50.0	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	<2.0	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	nd				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0	µg/kg TS	20		Intern metode
* Polyisoprene	<20.0	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	<5.0	µg/kg TS	5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Målesikkerhet <: Mindre enn >: Større enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Målesikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om målesikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v200

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AR-26-MX-004703-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur:
Analyseperiode: 02.02.2026 14:00 -
02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-120	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3 0.30-0.45	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	77.94				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	45 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0 µg/kg TS		5		Intern metode
* Polypropylene (PP)	<8.0 µg/kg TS		8		Intern metode
* Polystyren (PS)	<2.0 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	<2.0 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	nd				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-004708-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur: 02.02.2026 14:00 -
Analyseperiode: 02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-121	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3 0.45-0.65	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	84.94				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	45 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0 µg/kg TS		5		Intern metode
* Polypropylene (PP)	<8.0 µg/kg TS		8		Intern metode
* Polystyren (PS)	<2.0 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	<2.0 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	nd				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-004707-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur: 02.02.2026 14:00 -
Analyseperiode: 02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-122	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3 0.0-0.15	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	6.55				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Tørr prøvemengde for mikroplast	56	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	5490	µg/kg TS	5		Intern metode
* Polypropylene (PP)	1680	µg/kg TS	8		Intern metode
* Polystyren (PS)	114	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	46.6	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	<50.0	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	135	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	7460	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	799	µg/kg TS	20		Intern metode
* Polyisoprene	1190	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	383	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	2370	µg/kg TS			Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-004706-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur: 02.02.2026 14:00 -
Analyseperiode: 02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-123	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3 0.15-0.35	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	12.29				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	60 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0 µg/kg TS		5		Intern metode
* Polypropylene (PP)	10200 µg/kg TS		8		Intern metode
* Polystyren (PS)	3160 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	<2.0 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	13400 µg/kg TS				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense. LOD: Deteksjonsgrense. MU: Måleusikkerhet. <: Mindre enn. >: Sterre enn.
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-004702-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur: 02.02.2026 14:00 -
Analyseperiode: 02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-124	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3 0.35-0.55	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	9.17				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	70 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	5760 µg/kg TS		5		Intern metode
* Polypropylene (PP)	11800 µg/kg TS		8		Intern metode
* Polystyren (PS)	1360 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	171 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	<2.0 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	19100 µg/kg TS				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense. LOD: Deteksjonsgrense. MU: Måleusikkerhet. <: Mindre enn. >: Sterre enn.
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-004709-01

EUNOBE-00093350

Prøvemottak: 02.02.2026
Temperatur: 02.02.2026 14:00 -
Analyseperiode: 02.03.2026 15:35

Referanse: 20GLJOH1. Glenn
Johansson,
kostnadställe:202301

ANALYSERAPPORT

Prøvenr.:	441-2026-0202-125	Prøvetakingsdato:	01.02.2026		
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3 0.55-0.75	Analysestartdato:	02.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	8.09				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	62 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	5660 µg/kg TS		5		Intern metode
* Polypropylene (PP)	12300 µg/kg TS		8		Intern metode
* Polystyren (PS)	319 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	1080 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	19300 µg/kg TS				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

Appendix 4



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AR-26-MX-006663-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
19.03.2026 11:51

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-069	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3_NaCl 0-0-15	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Torr prøvemengde for mikroplast	75	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0	µg/kg TS	5		Intern metode
* Polypropylene (PP)	657	µg/kg TS	8		Intern metode
* Polystyren (PS)	<2.0	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	111	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	450	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	78.8	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	139	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	1440	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	860	µg/kg TS	20		Intern metode
* Polyisoprene	819	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	522	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	2200	µg/kg TS			Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Målesikkerhet <: Mindre enn >: Større enn
nd: Not detected/ ikke påvist Bakteriologiske resultater angitt som <1,<50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Målesikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om målesikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v200

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AR-26-MX-008607-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-070	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3_NaCl 0.15-0,35	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Torr prøvemengde for mikroplast	80	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	3160	µg/kg TS	5		Intern metode
* Polypropylene (PP)	3180	µg/kg TS	8		Intern metode
* Polystyren (PS)	238	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	322	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	69.4	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	902	µg/kg TS	50		Intern metode
* Polyetylenetereftalat (PET)	>300	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	<2.0	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	112	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	>7990	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0	µg/kg TS	20		Intern metode
* Polyisoprene	71.0	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	778	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	849	µg/kg TS			Intern metode

Merknader:

PET er over øvre måleområdet på 300µg

Estimert PET fra gjeldende kalibrering er 11591.93µg/kg

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1,<50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

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Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-008608-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-071	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	A3_NaCl 0,35-0,55	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	23.24				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	81	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	5920	µg/kg TS	5		Intern metode
* Polypropylene (PP)	4320	µg/kg TS	8		Intern metode
* Polystyren (PS)	2190	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	7870	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	114	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	<50.0	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	373	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	20800	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0	µg/kg TS	20		Intern metode
* Polyisoprene	<20.0	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	<5.0	µg/kg TS	5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-008609-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-072	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvemerking:	A3_NaCl 0,55-0,75	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Torr prøvemengde for mikroplast	75	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	>300	µg/kg TS	5		Intern metode
* Polypropylene (PP)	>300	µg/kg TS	8		Intern metode
* Polystyren (PS)	1910	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	409	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	2140	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	1770	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	593	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	>6820	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0	µg/kg TS	20		Intern metode
* Polyisoprene	89.1	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	<5.0	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	89.1	µg/kg TS			Intern metode
Merknader: PE og PP er over øvre måleområdet på 300ug Estimert PE fra gjeldende kalibrering er 9169,46µg/kg Estimert PP fra gjeldende kalibreringa er 5002.01ua/kg					

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Større enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

Rapporten må ikke gjengis, unntatt i sin helhet, uten laboratoriets skriftlige godkjenning. Resultatene gjelder kun for de(n) undersøkte prøven(e).

Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200



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AR-26-MX-008610-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-073	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3_NaCl 0-0,15	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Torr prøvemengde for mikroplast	64	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0	µg/kg TS	5		Intern metode
* Polypropylene (PP)	815	µg/kg TS	8		Intern metode
* Polystyren (PS)	60.6	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	176	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	25.5	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	653	µg/kg TS	50		Intern metode
* Polyetylenetereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	<2.0	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	1730	µg/kg TS			Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	362	µg/kg TS	20		Intern metode
* Polyisoprene	975	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	855	µg/kg TS	5		Intern metode
* Innhold av gummi	Contains rubber components				Intern metode
* Sum gummikomponenter	2190	µg/kg TS			Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen. LOQ: Kvantifiseringsgrense. LOD: Deteksjonsgrense. MU: Måleusikkerhet. <: Mindre enn. >: Sterre enn.
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD.

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

For mikrobiologiske analyser oppgis konfidensintervallet. Ytterligere opplysninger om måleusikkerhet fås ved henvendelse til laboratoriet.

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Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v200

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AR-26-MX-008611-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-074	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3_NaCl 0,15-0,30	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	26.35				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Torr prøvemengde for mikroplast	63 g TS		0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0 µg/kg TS		5		Intern metode
* Polypropylene (PP)	<8.0 µg/kg TS		8		Intern metode
* Polystyren (PS)	<2.0 µg/kg TS		2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0 µg/kg TS		4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0 µg/kg TS		4		Intern metode
* Polykarbonat (PC)	<20.0 µg/kg TS		20		Intern metode
* Polyvinylklorid (PVC)	<50.0 µg/kg TS		50		Intern metode
* Polyetylentereftalat (PET)	<4.0 µg/kg TS		4		Intern metode
* Polyamid 6 (PA6)	<2.0 µg/kg TS		2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0 µg/kg TS		20		Intern metode
* Sum kvantifiserte polymere	nd				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0 µg/kg TS		20		Intern metode
* Polyisoprene	<20.0 µg/kg TS		20		Intern metode
* Styren-butadiengummi (SBR)	<5.0 µg/kg TS		5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

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Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

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AR-26-MX-008612-01

EUNOBE-00093761

Prøvemottak: 17.02.2026
Temperatur:
Analyseperiode: 17.02.2026 12:00 -
09.04.2026 13:28

Referanse: 20GLJOH1

ANALYSERAPPORT

Prøvenr.:	441-2026-0217-075	Prøvetakingsdato:			
Prøvetype:	Jord	Prøvetaker:	Oppdragsgiver		
Prøvermerking:	B3_NaCl 0,30-0,45	Analysestartdato:	17.02.2026		
Analyse	Resultat	Enhet	LOQ	MU	Metode
* Alikvotfaktor (AQF)	21.9				Intern metode
* Kommentar LOQ	LOQ adjusted				Intern metode
* Tørr prøvemengde for mikroplast	63	g TS	0.5		Intern metode - Beregning
* Mikroplast >10 µm					
* Polyetylen (PE)	<5.0	µg/kg TS	5		Intern metode
* Polypropylene (PP)	<8.0	µg/kg TS	8		Intern metode
* Polystyren (PS)	<2.0	µg/kg TS	2		Intern metode
* Akrylnitril-butadien-styren (ABS)	<4.0	µg/kg TS	4		Intern metode
* Polymetylmetakrylat (PMMA)	<4.0	µg/kg TS	4		Intern metode
* Polykarbonat (PC)	<20.0	µg/kg TS	20		Intern metode
* Polyvinylklorid (PVC)	<50.0	µg/kg TS	50		Intern metode
* Polyetylentereftalat (PET)	<4.0	µg/kg TS	4		Intern metode
* Polyamid 6 (PA6)	<2.0	µg/kg TS	2		Intern metode
* Polyamid-6,6 (PA 66)	<20.0	µg/kg TS	20		Intern metode
* Sum kvantifiserte polymere	nd				Intern metode
* Gummipartikkel-komponenter >10 µm					
* Polybutadiene	<20.0	µg/kg TS	20		Intern metode
* Polyisoprene	<20.0	µg/kg TS	20		Intern metode
* Styren-butadiengummi (SBR)	<5.0	µg/kg TS	5		Intern metode
* Innhold av gummi	No rubber components				Intern metode
* Sum gummikomponenter	nd				Intern metode

Kopi til:

Anna Noren (anna.noren@chalmers.se)
Glenn Johansson (glennjo@chalmers.se)

Tegnforklaring:

* Ikke omfattet av akkrediteringen LOQ: Kvantifiseringsgrense LOD: Deteksjonsgrense MU: Måleusikkerhet <: Mindre enn >: Sterre enn
nd: Not detected/ ikke påvist. Bakteriologiske resultater angitt som <1, <50 e.l. betyr «ikke påvist». Resultat «Påvist» betyr større enn LOQ/ LOD

Måleusikkerhet er angitt med dekningsfaktor k=2. Beslutningsregel for vurdering av om resultatet er utenfor grenseverdi-området, er basert på enkle akseptkriterier «delt risiko» (w=0, <50% Probability of False Accept). Det henvises til www.eurofins.no for nærmere beskrivelse.

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Eurofins er ikke ansvarlig for informasjon oppgitt fra kunde, eller i de tilfeller hvor oppgitt informasjon kan påvirke gyldigheten til analyseresultatene.

Resultater gjelder prøven slik den ble mottatt hos laboratoriet.

Side 1 av 2

AR-001 v 200

Appendix 5

Rapport

Sida 1 (11)



L2650426

2366WCIOJPL



Ankomstdatum **2026-03-23**
Utfärdad **2026-04-16**

Chalmers Tekniska Högskola
Glenn Johansson

Sven Hultins gata 8
412 96 Göteborg
Sweden

Projekt **20GLJOH1**

Analys: LV3A

Er beteckning	A3 0,35-0,55_1					
Provtagare	Glenn Johansson					
Labnummer	U11893841					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
Malning stålfat *	yes		ArbMom	1	I	BELE
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	41.6		ml	3	I	BODJ
Volym efter filtrering *	41.6		ml	3	I	BODJ
Ca	48100	9100	mg/l	4	H	IR
Fe	1240	251	mg/l	4	H	IR
Mg	1340	210	mg/l	4	H	IR
Al	4330000	857000	µg/l	4	H	IR
As	4020	762	µg/l	4	H	IR
Ba	217000	43700	µg/l	4	H	IR
Cd	1380	230	µg/l	4	H	IR
Co	17200	3530	µg/l	4	H	IR
Cr	10700	2190	µg/l	4	H	IR
Cu	1010000	200000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	232000	47100	µg/l	4	H	IR
Mo	740	170	µg/l	4	H	IR
Ni	20600	4150	µg/l	4	H	IR
Pb	133000	25800	µg/l	4	H	IR
V	4060	839	µg/l	4	H	IR
Zn	2060000	723000	µg/l	4	H	IR

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2026.04.16 15:14:07

Rapport

Sida 2 (11)



L2650426

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Er beteckning	A3 0,35-0,55_1					
Provtagare	Laksteg 2 Glenn Johansson					
Labnummer	U11893842					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	112		ml	3	I	BODJ
Volym efter filtrering *	112		ml	3	I	BODJ
Ca	1600	300	mg/l	4	H	IR
Fe	758	154	mg/l	4	H	IR
Mg	129	22	mg/l	4	H	IR
Al	1250000	250000	µg/l	4	H	IR
As	5500	1040	µg/l	4	H	IR
Ba	120000	24000	µg/l	4	H	IR
Cd	56.4	21.7	µg/l	4	H	IR
Co	1100	242	µg/l	4	H	IR
Cr	3150	677	µg/l	4	H	IR
Cu	227000	45400	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	14300	2930	µg/l	4	H	IR
Mo	1210	322	µg/l	4	H	IR
Ni	3630	753	µg/l	4	H	IR
Pb	30900	5950	µg/l	4	H	IR
V	3140	644	µg/l	4	H	IR
Zn	92000	32400	µg/l	4	H	IR

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Rapport

Sida 3 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_1					
Provtagare	Laksteg 3 Glenn Johansson					
Labnummer	U11893843					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	30		ml	3	I	BODJ
Volym efter filtrering *	30		ml	3	I	BODJ
Ca	8310	440	mg/l	4	H	IR
Fe	2700	551	mg/l	4	H	IR
Mg	1210	190	mg/l	4	H	IR
Al	7160000	1420000	µg/l	4	H	IR
As	2190	382	µg/l	4	H	IR
Ba	173000	34500	µg/l	4	H	IR
Cd	184	31	µg/l	4	H	IR
Co	9940	2050	µg/l	4	H	IR
Cr	6140	1250	µg/l	4	H	IR
Cu	331000	65700	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	125000	25400	µg/l	4	H	IR
Mo	103	58	µg/l	4	H	IR
Ni	23100	4620	µg/l	4	H	IR
Pb	63200	12400	µg/l	4	H	IR
V	3840	787	µg/l	4	H	IR
Zn	474000	166000	µg/l	4	H	IR

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Rapport

Sida 4 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_1 Laksteg 4 Glenn Johansson					
Provtagare	Glenn Johansson					
Labnummer	U11893844					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	40		ml	3	I	BODJ
Volym efter filtrering *	40		ml	3	I	BODJ
Ca	13800	2500	mg/l	4	H	IR
Fe	21700	4470	mg/l	4	H	IR
Mg	2480	420	mg/l	4	H	IR
Al	15100000	2990000	µg/l	4	H	IR
As	4830	862	µg/l	4	H	IR
Ba	321000	66800	µg/l	4	H	IR
Cd	282	51	µg/l	4	H	IR
Co	26800	5540	µg/l	4	H	IR
Cr	49600	10100	µg/l	4	H	IR
Cu	882000	175000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	287000	59500	µg/l	4	H	IR
Mo	5100	1050	µg/l	4	H	IR
Ni	113000	23100	µg/l	4	H	IR
Pb	114000	23700	µg/l	4	H	IR
V	12900	2670	µg/l	4	H	IR
Zn	677000	238000	µg/l	4	H	IR

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Rapport

Sida 5 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_1					
Provtagare	Laksteg 5 Glenn Johansson					
Labnummer	U11893845					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	50		ml	3	I	BODJ
Volym efter filtrering *	50		ml	3	I	BODJ
Ca	4820	930	mg/l	4	H	IR
Fe	18200	3710	mg/l	4	H	IR
Mg	1080	180	mg/l	4	H	IR
Al	5860000	1200000	µg/l	4	H	IR
As	5040	983	µg/l	4	H	IR
Ba	191000	38500	µg/l	4	H	IR
Cd	230	41	µg/l	4	H	IR
Co	6980	1440	µg/l	4	H	IR
Cr	53000	10800	µg/l	4	H	IR
Cu	1230000	243000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	140000	28600	µg/l	4	H	IR
Mo	3880	805	µg/l	4	H	IR
Ni	40300	8040	µg/l	4	H	IR
Pb	26000	5040	µg/l	4	H	IR
V	9810	2050	µg/l	4	H	IR
Zn	178000	62500	µg/l	4	H	IR

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Rapport

Sida 6 (11)



L2650426

2366WCI0JPL



Er beteckning	A3 0,35-0,55_2					
Provtagare	Laksteg 1 Glenn Johansson					
Labnummer	U11893846					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
Malning stålfat *	yes		ArbMom	1	I	BELE
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	41.6		ml	3	I	BODJ
Volym efter filtrering *	41.6		ml	3	I	BODJ
Ca	47900	9300	mg/l	4	H	IR
Fe	1180	240	mg/l	4	H	IR
Mg	1350	250	mg/l	4	H	IR
Al	4280000	864000	µg/l	4	H	IR
As	3390	646	µg/l	4	H	IR
Ba	196000	39000	µg/l	4	H	IR
Cd	814	140	µg/l	4	H	IR
Co	12400	2530	µg/l	4	H	IR
Cr	10100	2060	µg/l	4	H	IR
Cu	1490000	296000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	518000	106000	µg/l	4	H	IR
Mo	763	174	µg/l	4	H	IR
Ni	24800	5010	µg/l	4	H	IR
Pb	138000	26800	µg/l	4	H	IR
V	3170	651	µg/l	4	H	IR
Zn	2090000	733000	µg/l	4	H	IR

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Client Service
Margit.Dyrland@ALSGlobal.com

Rapport

Sida 7 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_2					
Provtagare	Laksteg 2 Glenn Johansson					
Labnummer	U11893847					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	112		ml	3	I	BODJ
Volym efter filtrering *	112		ml	3	I	BODJ
Ca	1110	200	mg/l	4	H	IR
Fe	848	174	mg/l	4	H	IR
Mg	75.8	11.9	mg/l	4	H	IR
Al	1380000	280000	µg/l	4	H	IR
As	5490	1290	µg/l	4	H	IR
Ba	80400	15800	µg/l	4	H	IR
Cd	42.4	19.6	µg/l	4	H	IR
Co	578	133	µg/l	4	H	IR
Cr	3910	808	µg/l	4	H	IR
Cu	273000	54300	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	143000	29400	µg/l	4	H	IR
Mo	1590	385	µg/l	4	H	IR
Ni	3110	655	µg/l	4	H	IR
Pb	28800	5550	µg/l	4	H	IR
V	3990	834	µg/l	4	H	IR
Zn	120000	42200	µg/l	4	H	IR

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Client Service
Margit.Dyrland@ALSGlobal.com

Rapport

Sida 8 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_2					
Provtagare	Laksteg 3 Glenn Johansson					
Labnummer	U11893848					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	30		ml	3	I	BODJ
Volym efter filtrering *	30		ml	3	I	BODJ
Ca *	8220	390	mg/l	4	I	IR
Fe	2850	583	mg/l	4	H	IR
Mg	1200	200	mg/l	4	H	IR
Al	8790000	1790000	µg/l	4	H	IR
As	1570	282	µg/l	4	H	IR
Ba	191000	39300	µg/l	4	H	IR
Cd	144	25	µg/l	4	H	IR
Co	7660	1600	µg/l	4	H	IR
Cr	6610	1350	µg/l	4	H	IR
Cu	516000	102000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	464000	98300	µg/l	4	H	IR
Mo	81.7	56.6	µg/l	4	H	IR
Ni	31200	6350	µg/l	4	H	IR
Pb	78200	15100	µg/l	4	H	IR
V	3950	833	µg/l	4	H	IR
Zn	530000	188000	µg/l	4	H	IR

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Rapport

Sida 9 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_2					
Provtagare	Laksteg 4 Glenn Johansson					
Labnummer	U11893849					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	40		ml	3	I	BODJ
Volym efter filtrering *	40		ml	3	I	BODJ
Ca	11600	2050	mg/l	4	H	IR
Fe	15500	3140	mg/l	4	H	IR
Mg	2110	390	mg/l	4	H	IR
Al	12300000	2420000	µg/l	4	H	IR
As	3140	554	µg/l	4	H	IR
Ba	241000	48100	µg/l	4	H	IR
Cd	157	28	µg/l	4	H	IR
Co	17600	3590	µg/l	4	H	IR
Cr	38800	7900	µg/l	4	H	IR
Cu	1330000	265000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	256000	51700	µg/l	4	H	IR
Mo	4140	847	µg/l	4	H	IR
Ni	117000	23600	µg/l	4	H	IR
Pb	79400	15600	µg/l	4	H	IR
V	9170	1890	µg/l	4	H	IR
Zn	567000	199000	µg/l	4	H	IR

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Rapport

Sida 10 (11)



L2650426

2366WCIOJPL



Er beteckning	A3 0,35-0,55_2					
Provtagare	Laksteg 5 Glenn Johansson					
Labnummer	U11893850					
Parameter	Resultat	Mätosäkerhet (±)	Enhet	Metod	Utf	Sign
TS innan lakning	-----	2%	%	2	I	BODJ
Invägning *	1.00		g	3	I	BODJ
Volym tillsatt *	50		ml	3	I	BODJ
Volym efter filtrering *	50		ml	3	I	BODJ
Ca	4850	950	mg/l	4	H	IR
Fe	17200	3530	mg/l	4	H	IR
Mg	1210	230	mg/l	4	H	IR
Al	5390000	1080000	µg/l	4	H	IR
As	5650	1080	µg/l	4	H	IR
Ba	231000	45600	µg/l	4	H	IR
Cd	66.3	14.1	µg/l	4	H	IR
Co	8030	1650	µg/l	4	H	IR
Cr	44900	9240	µg/l	4	H	IR
Cu	3580000	745000	µg/l	4	H	IR
Hg	<5		µg/l	4	H	IR
Mn	140000	29900	µg/l	4	H	IR
Mo	4200	872	µg/l	4	H	IR
Ni	169000	34400	µg/l	4	H	IR
Pb	27800	5400	µg/l	4	H	IR
V	10100	2100	µg/l	4	H	IR
Zn	192000	67400	µg/l	4	H	IR

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Client Service
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Appendix 6

Sida : 2 av 9
Ordernummer : LE2605209
Kund : Chalmers Tekniska Högskola



Analysresultat

Provbeteckning A3 0,15-0,35 DS-AL-1
Laboratoriets provnummer LE2605209-001
Provtagningsdatum / tid 2026-03-23
Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Uppslutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	957000	± 174000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	1860	± 327	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	17900	± 2490	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	5030	± 591	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	88.9	± 11.8	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	1210	± 180	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	2670	± 438	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	84900	± 14500	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	490	± 64	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.302	± 0.061	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	91.7	± 18.9	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	320	± 50	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	30300	± 5940	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	106	± 16	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	6630	± 1210	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	3970	± 461	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	16200	± 2250	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	1620	± 206	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	241000	± 28100	µg/L	4.0	W-SFMS-66A	LE

Sida : 3 av 9
 Ordernummer : LE2605209
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3 0,15-0,35 DS-AL-2
 Laboratoriets provnummer LE2605209-002
 Provtagningsdatum / tid 2026-03-23
 Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Upps lutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	1140000	± 206000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	2020	± 355	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	17900	± 2490	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	4860	± 571	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	88.1	± 11.7	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	1360	± 201	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	2840	± 466	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	116000	± 19900	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	621	± 82	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.0429	± 0.0119	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	90.7	± 18.7	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	299	± 47	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	36200	± 7080	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	95.5	± 14.6	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	6340	± 1160	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	4930	± 572	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	31500	± 4390	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	1710	± 217	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	2770000	± 323000	µg/L	4.0	W-SFMS-66A	LE

Sida : 4 av 9
 Ordernummer : LE2605209
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3 0,35-0,55 DS-AL-1
 Laboratoriets provnummer LE2605209-003
 Provtagningsdatum / tid 2026-03-23
 Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Upps lutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	1950000	± 355000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	960	± 169	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	4090	± 569	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	10600	± 1250	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	470	± 63	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	2650	± 393	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	4070	± 668	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	169000	± 29000	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	393	± 52	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.0473	± 0.0125	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	139	± 29	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	448	± 70	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	42900	± 8390	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	65.1	± 9.9	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	9000	± 1640	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	6470	± 751	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	36800	± 5120	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	1940	± 246	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	311000	± 36300	µg/L	4.0	W-SFMS-66A	LE

Sida : 5 av 9
 Ordernummer : LE2605209
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3 0,35-0,55 DS-AL-2
 Laboratoriets provnummer LE2605209-004
 Provtagningsdatum / tid 2026-03-23
 Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Uppsättning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	2170000	± 393000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	1120	± 197	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	3910	± 543	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	11100	± 1300	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	278	± 37	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	4420	± 655	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	4210	± 691	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	214000	± 36600	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	385	± 51	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.0681	± 0.0159	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	134	± 28	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	490	± 77	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	67600	± 13200	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	58.5	± 8.9	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	8930	± 1630	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	6970	± 808	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	42200	± 5870	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	2030	± 257	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	372000	± 43400	µg/L	4.0	W-SFMS-66A	LE

Sida : 6 av 9
 Ordernummer : LE2605209
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3 0,55-0,75 DS-AL-1
 Laboratoriets provnummer LE2605209-005
 Provtagningsdatum / tid 2026-03-23
 Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Upps lutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	2340000	± 425000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	1210	± 212	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	4150	± 577	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	12200	± 1440	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	358	± 48	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	2820	± 418	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	4480	± 735	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	261000	± 44600	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	479	± 63	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.0574	± 0.0141	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	159	± 33	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	534	± 84	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	50400	± 9870	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	69.7	± 10.6	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	8040	± 1470	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	8300	± 962	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	44500	± 6200	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	2170	± 276	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	405000	± 47200	µg/L	4.0	W-SFMS-66A	LE

Sida : 7 av 9
 Ordernummer : LE2605209
 Kund : Chalmers Tekniska Högskola



Provbeteckning A3 0,55-0,75 DS-AL-2
 Laboratoriets provnummer LE2605209-006
 Provtagningsdatum / tid 2026-03-23
 Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Uppslutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	2100000	± 381000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	2070	± 365	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	6490	± 903	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	10400	± 1220	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	185	± 25	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	2100	± 311	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	3960	± 649	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	232000	± 39800	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	582	± 77	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.506	± 0.102	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	159	± 33	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	537	± 84	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	41100	± 8050	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	175	± 27	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	8310	± 1520	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	6130	± 711	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	34800	± 4850	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	2240	± 284	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	556000	± 64900	µg/L	4.0	W-SFMS-66A	LE



Provbeteckning A3 0,35-0,55 AL-DS
Laboratoriets provnummer LE2605209-007
Provtagningsdatum / tid 2026-03-23
Matris LAKNING

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
P-HNO3-AC						
Uppslutning	Ja	----	-	-	W-PV-AC	LE
Metaller och grundämnen						
V-3b						
Al, aluminium	1650000	± 300000	µg/L	10.0	W-SFMS-66A	LE
As, arsenik	1580	± 278	µg/L	0.50	W-SFMS-66A	LE
Ba, barium	8970	± 1250	µg/L	1.00	W-SFMS-66A	LE
Ca, kalcium	7790	± 915	mg/L	0.20	W-SFMS-66A	LE
Cd, kadmium	239	± 32	µg/L	0.050	W-SFMS-66A	LE
Co, kobolt	2440	± 361	µg/L	0.20	W-SFMS-66A	LE
Cr, krom	3120	± 512	µg/L	0.90	W-SFMS-66A	LE
Cu, koppar	161000	± 27600	µg/L	1.00	W-SFMS-66A	LE
Fe, järn	358	± 47	mg/L	0.0100	W-SFMS-66A	LE
Hg, kvicksilver	0.327	± 0.066	µg/L	0.020	W-AFS-17V3b	LE
K, kalium	213	± 44	mg/L	0.40	W-SFMS-66A	LE
Mg, magnesium	352	± 55	mg/L	0.20	W-SFMS-66A	LE
Mn, mangan	36100	± 7060	µg/L	0.90	W-SFMS-66A	LE
Mo, molybden	127	± 19	µg/L	0.50	W-SFMS-66A	LE
Na, natrium	221	± 40	mg/L	0.500	W-SFMS-66A	LE
Ni, nickel	4710	± 547	µg/L	0.60	W-SFMS-66A	LE
Pb, bly	34700	± 4830	µg/L	0.50	W-SFMS-66A	LE
V, vanadin	1610	± 205	µg/L	0.20	W-SFMS-66A	LE
Zn, zink	248000	± 28900	µg/L	4.0	W-SFMS-66A	LE

Metodsammanfattningar

Analysmetoder	Metod
W-AFS-17V3b	Analys av kvicksilver (Hg) i förorenat vatten med AFS enligt SS-EN ISO 17852:2008 efter uppslutning av prov enligt W-PV-AC.
W-SFMS-66A	Analys av metaller i förorenat vatten med ICP-SFMS enligt SS-EN ISO 17294-2:2023 och US EPA Metod 200.8:1994 efter uppslutning av prov enligt W-PV-AC.

Beredningsmetoder	Metod
W-PV-AC	Upplösning med salpetersyra i autoklav enligt SS 28150:1993 (SE-SOP-0400).

Sida : 2 av 3
 Ordernummer : LE2605200
 Kund : Chalmers Tekniska Högskola



Analysresultat

Provbeteckning DS+AL A3 0,35-0,55
 Laboratoriets provnummer LE2605200-001
 Provtagningsdatum / tid ej specificerad
 Matris JORD

Parameter	Resultat	MU	Enhet	LOR	Metod	Utf.
Provberedning						
MG-2						
Torkning	Ja	----	-	-	S-PP-dry50	LE
PP-mill						
Malning	Ja	----	-	-	S-PP-mill	LE
Metaller och grundämnen						
Al, aluminium	41100	± 5740	mg/kg TS	0.002	S-SFMS-49	LE
Ca, kalcium	52100	± 6510	mg/kg TS	0.01	S-SFMS-49	LE
Ce, cerium	37.5	± 4.6	mg/kg TS	0.000002	S-SFMS-49	LE
Fe, järn	44600	± 6840	mg/kg TS	0.004	S-SFMS-49	LE
K, kalium	7250	± 877	mg/kg TS	0.004	S-SFMS-49	LE
Mg, magnesium	7450	± 984	mg/kg TS	0.002	S-SFMS-49	LE
Mn, mangan	678	± 90	mg/kg TS	0.0002	S-SFMS-49	LE
Na, natrium	129000	± 19400	mg/kg TS	0.004	S-SFMS-49	LE
P, fosfor	2730	± 367	mg/kg TS	0.001	S-SFMS-49	LE
Si, kisel	172000	± 22800	mg/kg TS	0.008	S-SFMS-49	LE
Ti, titan	5040	± 687	mg/kg TS	0.0002	S-SFMS-49	LE
MG-2						
As, arsenik	13.4	± 2.7	mg/kg TS	3.00	S-SFMS-16	LE
Ba, barium	1080	± 219	mg/kg TS	5.00	S-SFMS-49	LE
Be, beryllium	1.08	± 0.18	mg/kg TS	0.500	S-SFMS-49	LE
Cd, kadmium	0.641	± 0.082	mg/kg TS	0.0500	S-SFMS-16	LE
Co, kobolt	26.9	± 3.7	mg/kg TS	0.100	S-SFMS-16	LE
Cr, krom	347	± 45	mg/kg TS	10.0	S-SFMS-49	LE
Cu, koppar	2350	± 419	mg/kg TS	1.00	S-SFMS-16	LE
Hg, kvicksilver	<0.01	----	mg/kg TS	0.0100	S-AFS-17A	LE
Mo, molybden	27.4	± 4.3	mg/kg TS	5.00	S-SFMS-16	LE
Nb, niob	7.89	± 1.03	mg/kg TS	5.00	S-SFMS-49	LE
Ni, nickel	179	± 27	mg/kg TS	2.00	S-SFMS-16	LE
Pb, bly	185	± 40	mg/kg TS	1.00	S-SFMS-16	LE
S, svavel	1210	± 166	mg/kg TS	100	S-SFMS-16	LE
Sc, skandium	3.65	± 0.59	mg/kg TS	1.00	S-SFMS-49	LE
Sn, tenn	62.8	± 10.2	mg/kg TS	20.0	S-SFMS-16	LE
Sr, strontium	242	± 38	mg/kg TS	3.00	S-SFMS-49	LE
V, vanadin	36.5	± 4.8	mg/kg TS	2.00	S-SFMS-49	LE
W, volfram	9.55	± 1.52	mg/kg TS	1.00	S-SFMS-49	LE
Y, yttrium	13.7	± 1.8	mg/kg TS	0.500	S-SFMS-49	LE
Zn, zink	2210	± 292	mg/kg TS	4.00	S-SFMS-16	LE
Zr, zirkonium	146	± 24	mg/kg TS	0.500	S-SFMS-49	LE
Fysikaliska parametrar						
MG-2						
LOI 1000°C	13.4	± 5.0	% TS	0.100	S-LOI1000	LE
Summa oxider	79.4 *	----	% TS	0.001	S-SUM-OXID	LE
Torrsubstans vid 105°C	99.1	± 2.0	%	1.0	S-DW105	LE