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RFSC
REACH-Eisenhüttenschlacken-Konsortium GbR
**REACH-Ferrous Slag-Consortium GbR**

March 11th, 2026

# Assessment of the Dutch Provisional Restriction on LD and EAF Slags under Article 129 REACH

## Executive Summary


- The additional information submitted by the Netherlands in February 2026 does not provide the "justifiable grounds" required under Article 129 (1) REACH. No urgent, significant or intrinsic substance risk has been demonstrated that could warrant provisional national measures.
- The Dutch justification is largely incident-based, application-dependent and characterised by acknowledged uncertainty. It relies on precautionary wording ("may occur", "could lead to", "considered possible"). It is not based on demonstrated causal relationships supported by robust scientific or circumstantial evidence.
- The nine cited cases do not provide evidence of a systemic or substance-intrinsic hazard associated with LD steel slag while some even show non-compliant installation or failure to respect conditions in product certificate. Across all cases, no quantified exposure data, no robust causal analysis and no adequate site-specific risk assessment are presented.
- The claim that LD slag should be classified for serious eye damage (Eye Dam. 1) and respiratory irritation (STOT SE 3) is not supported by robust scientific evidence. Even if the REACH dossier may require refinement, the currently available validated GLP-compliant data do not justify classification under the CLP Regulation.
- The extension of the measure to EAF slag is not evidence-based and justified. The Dutch justification acknowledges that triggering incidents concern LD slag, while comparable incident data for EAF slag are absent. Reliable test data for EAF carbon steel slag do not indicate irritation or corrosion properties.
- Acceptance of the Dutch provisional measure would trigger a Union restriction procedure under Article 129 (3) REACH and would lead to significant socio-economic consequences for the EU steel sector, recycling markets and climate objectives. Restricting established uses would impose disproportionate economic burdens and increase reliance on primary raw materials.
- Additional information submitted after notification cannot cure procedural deficiencies under Article 129 (1) REACH. Nor can the precautionary principle apply without a structured and science-based risk assessment demonstrating an existing serious risk.
- If a revised hazard classification were ever to be considered, the proper regulatory sequence would first require dossier updates and reassessment of risk management measures under REACH. Only thereafter could it be examined whether any restriction is necessary.
- The Dutch authorities acknowledge shortcomings in national use regulation and enforcement. Since other Member States already manage ferrous slags safely through specific leaching limits and defined application conditions, these national shortcomings should first be addressed through improved regulatory measures and enforcement, rather than restriction under REACH.




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# Factsheet on Ferrous Slags

## Executive Summary


- Ferrous slags are REACH-registered valuable raw material inherent to iron and steel making process. Steel cannot be produced without production of slags.
- Ferrous slags are established secondary raw materials in Europe for over 100 years which their use from 2000-2024 has prevented 1.21 billion tons natural rock extraction and 319 million tons of $CO_2$ emissions.
- BOS and EAF (including carbon (EAF C) and stainless steel (EAF S)) slags are members of ferrous slag family and have been used as secondary raw material in road construction by up to 61% as major downstream use compared to cement, metallurgical processes, and fertilizers in 2024 in EU and UK.
- Depending on the steel production route, different volumes of limestone and dolomite are required. EAF carbon steel slags typically contain negligible or no free CaO, as lime is incorporated into stable mineral phases. BOS slags may contain limited free CaO; however, it is largely embedded within silicate matrices, significantly reducing bioavailable alkalinity.
- Ferrous slags are rock-like crystalline materials in which trace metals are structurally bound within mineral phases, so total elemental content is not a valid proxy for hazard and any metal-related concern depends on leaching under specific environmental conditions.
- Current available GLP-compliant toxicological tests with solid and eluates of BOS and EAF do not support automatic classification for eye/skin irritation based solely on high pH values resulted from high free lime content.
- RFSC acknowledges remaining dossier data gaps and generation of additional tests results for scientific based registration.




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## 1. Steel production and types of ferrous slags

Ferrous slags are process-derived materials formed during steel production, where they fulfil essential metallurgical functions by binding oxidic constituents of the molten metal and forming a protective top layer that limits heat loss and prevents oxidation.

Steel is produced through two main routes: ore-based steelmaking (about 60% of EU production [1]) and scrap-based steelmaking (about 40% [1**Fehler! Textmarke nicht definiert.**]). The co-production of slags is an inherent part of both processes to produce steel.

In ore-based steelmaking, iron ore is reduced to metallic iron and then converted into steel. Typical inputs include iron ore, coal and limestone. The main ore-based production route is ironmaking via the blast furnace (BF) with air cooled (ABS) or glass granulated slags (GBS) followed by steelmaking in the basic oxygen furnace which basic oxygen or Linz Donawitz slags (BOS or LD slag) are parallelly produced in it.

In scrap-based steelmaking, recycled steel scrap is melted in an electric arc furnace (EAF). Main inputs are steel scrap (optionally: Direct Reduced Iron (DRI), hot metal, or other sources of metallic iron). Fluxes (e.g., lime, limestone, dolomite) are added to remove impurities. During melting, the fluxes combine with non-metallic scrap components and incompatible elements to form a liquid slag. Depending on the steel grade, two slag categories are produced:

EAF C – Slag from carbon steel production (~80% of the EAF slag volumes in Europe)

EAF S – Slag from stainless / high-alloy steel production (~20% of the volumes)

Further processing of crude steel in secondary metallurgical vessels results in additional secondary metallurgical slags (SMS).

In any case, all different ferrous slags categories are produced after the process at a very high temperature (>1500 °C), as an industrial mineral lava.

In total, five main slag families can be distinguished (see table 1).

Table 1: Slag families and corresponding EINECS- and CAS-numbers

| No | IUPAC Name | Abbreviation | Other names | EC Number<br>CAS Number |
|---|---|---|---|---|
| 1 | Slag, ferrous metal, blast furnace (granulated) | GBS | Granulated Blast Furnace Slag | 266-002-0<br>65996-69-2 |
| | Slag, ferrous metal, blast furnace (air-cooled) | ABS | Air-cooled Blast Furnace Slag | 266-002-0<br>65996-69-2 |
| 2 | Slags, steelmaking, converter | BOS | Basic Oxygen Furnace Slag (converter slag) | 294-409-3<br>91722-09-7 |
| 3 | Slag, steelmaking, elec. furnace (carbon steel production) | EAF-C | Electric Arc Furnace Slag (from Carbon steel production) | 932-275-6<br>- |
| 4 | Slag, steelmaking, elec. furnace (stainless/high alloy steel production) | EAF-S | Electric Arc Furnace Slag (from Stainless/ high alloy steel production) | 932-476-9<br>- |
| 5 | Slags, steelmaking | SMS | Steelmaking slag | 266-004-1<br>65996-71-6 |

Each ferrous slag type is fully registered under Regulation (EC) No 1907/2006 (REACH) at present without any hazard classification under Regulation (EC) No 1272/2008 (CLP). It is important to recognize that slags belong to the substance category *unknown or 'variable composition, complex reaction products or biological materials (UVCB)' substances,* and not mixtures. These substances contain numerous components which, in the case of slags, are mineral phases just like those found in natural rocks. Their exact composition and amounts may vary as a result of differences in raw materials and manufacturing processes. However, they share strong similarity in main compositional elements and mineralogy which allows grouping of the five members under Ferrous Slag category and read across approaches.

## 2. Ferrous slags and their sustainable use

Ferrous slags have been used for over 100 years in Europe and in downstream industries which has avoided 1.21 billion tons of natural rock extraction and prevented 319 million tons of $CO_2$ emissions over the 2000-2024 period [2, 3].

In the year 2024, 36 million tons of ferrous slags were produced in the EU and UK: 19.6 million tons of ABS/GBS, and 16.5 million tons of Steel furnace slag, including BOS (~60 %) and EAF (~30 %). While ABS/GBS were mainly used in Cement Production, BOS and EAF were used on different markets, such as road construction (61 %), cement/concrete additives (12.3 %), recycling into metallurgical processes (12.1 %), fertilizers (8.1 %), and hydraulic engineering (4.7 %) [1, 2].

More specifically in Netherlands, in 2024, Tata Steel IJmuiden produced approximately 1,200 kilo tons of GBS and 575 kilo tons of BOS. Nearly all produced GBS are utilized in cement production. BOS slag, however, has a more diversified application profile: 100 kilo tons is used in cement and concrete, 515 kilo tons in civil engineering works such as road construction, and 120 kilo tons is recycled internally in the BOF process for metallurgical purposes.

Due to recently imposed Dutch restrictions on the use of steel slag in civil engineering applications, the market of BOS in such works within the Netherlands has effectively come to a halt. Since slag formation is inherent to steelmaking, alternative outlets must be found. Identifying new applications is challenging due to the need for technical validation and market development, as well as uniformity in European, national and regional laws and regulations. These constraints carry significant implications for Tata Steel IJmuiden, the Netherlands' sole steel producer and employer of 9,000 people.

## 3. Free lime content

Lime, limestone ($CaO/CaCO_3$) and/or dolomite ($CaMg(CO_3)_2$) is added in steelmaking as a flux to form slag and remove elements unwanted in the steel such as phosphorus (P), and silica (Si). In electric arc furnace (EAF) carbon steel production, the required lime addition is typically lower than in basic oxygen steelmaking (BOS), reflecting generally lower requirements for tramp elements for typical EAF carbon steel products (often long products) compared with BOS products (often flat products). Furthermore, the higher iron oxide content in EAF slag compared to BOS slag means that lime has a higher solubility. Consequently, EAF C slags usually contain negligible or no free lime, as the calcium (Ca) is fully incorporated into the mineral phases in the slag matrix.

In BOS slags, the added lime or limestone does not always fully dissolve or react during slag formation. As a result, free lime may be present in varying amounts. However, the free CaO is mainly embedded within silicate and ferrite matrices ($C_2S$, $C_3S$, Ca–Mg silicates). On air exposure, surface CaO rapidly hydrates and carbonates, forming a $Ca(OH)_2/CaCO_3$ layer that strongly limits hydroxide release. Thus, the bioavailable alkalinity of slag particles is far lower than that of pure free lime (CaO) or portlandite ($Ca(OH)_2$) dusts.

The distinction concerning free CaO in different slag types is well recognized in technical standards and guidelines. Due to the free lime, BOS slags can show volume stability issues, whereas EAF C slags are generally volume-stable (e.g. [4], [5], [6]). These findings are supported by decades of analytical data from the FEhS Institute (see Appendix to this Factsheet) and international literature on ferrous slags.

## 4. Heavy metal content and leaching from ferrous slags

Oxides and heavy metals in the slag do not occur in isolated form, neither as a pure metallic element nor as a potentially harmful chemical compound. Slags are not mixtures of chemical substances. Instead, slags are complex structures consisting of individual mineral phases that interlock with each other. Exactly like natural igneous rocks, these mineral phases represent the fundamental building blocks of slags. The inner texture of slags and the interlocking of mineral phases is comparable to a natural basalt rock as an example (see Backscattered Electron (BSE) images included in [7] and [8]). Typical mineral phases present in BOS and EAF slags is already presented in Appendix 1 of the join statement [9] published on 7th October 2025.

Each mineral phase in ferrous slags consists of a solid crystalline lattice formed by an ordered, repeating arrangement of atoms or ions, which gives rise to characteristic crystal structures and shapes. The principal elements, oxygen, silicon, aluminium, iron, calcium, and magnesium, govern the fundamental mineral properties, including crystal structure and physical characteristics such as hardness, colour, and density. In addition to these major constituents, minerals also contain minor and trace elements (<5 wt% and <1 wt%, respectively). Depending on ionic radius and charge, these elements may partially substitute for the main elements within the crystal lattice, a process known as substitution or diadochy. As a result, numerous trace elements are incorporated into existing mineral structures rather than forming separate mineral phases. Notably, the mineral phases present in ferrous slags are also commonly found in natural igneous rocks, meaning that steelmaking does not generate fundamentally new mineral components.

Considering total content of minor and trace elements to conclude whether these components pose adverse effects is scientifically not accepted. These components are incorporated in stable mineral phases and their release upon contact with water depends on many factors such as grain size distribution, liquid to solid ratio (L/S), pH values, and solubility of each specific mineral phase [e.g., 10]. Therefore the leaching heavily depends on environmental factors and use conditions.

To ensure that the hazards from potentially harmful heavy metals within the ferrous slags is identified, RFSC has performed reliable OECD-guided toxicological and eco-toxicological tests (see tables 2 to 5 for examples of these tests). While in eco-toxicological tests the organisms are exposed to released bioavailable fraction of potentially harmful heavy metals, none of the test reports indicate signs of heavy metal relevant acute toxicity. Consequently, under the tested relevant leaching conditions, metal release is not causing toxicity. Any potential concern is scenario specific and does not show intrinsic hazard.

## 5. Toxicological data on skin, eye and oral irritation potential of steel slags

The REACH Ferrous Slag Consortium (RFSC) has performed many toxicological tests on eye-, skin- and respirator irritation, as presented in the respective REACH registration dossiers. More than 25 irritation/corrosion studies (skin + eye) have been completed with the principles of Good Laboratory Practice (GLP) across ferrous slag types. Nine of these studies have reliability score of one.

Some slag types were tested as finely ground solid and for some (e.g., BOS and EAF-S) testing was performed with eluates instead of finely ground solids. This deviation from standard guidance was scientifically justified because the fine grinding required for direct solid testing generates artificially sharp-edged particles that are not representative of the material under realistic exposure conditions. Such particles may cause mechanical injury to the eye and would confound the assessment of irritation related to chemical effects such as free lime content or pH value.

Table 2 summarizes the studies performed on the original solid materials, while Table 3 provides an overview of the tests conducted with eluates.

Overall, the available data indicate that ferrous slags — including materials containing free lime and slags whose eluates exhibit elevated pH values above 11.5 do not per se cause irritant effects neither on skin nor eye, demonstrating that a high pH value alone does not lead automatically to corrosion/irritation properties. According to the CLP Regulation (EC) No. 1272/2008, Annex I, Section 3.3.2.2.4, substances and mixtures with extreme pH values (≤2 or ≥ 11.5) are presumed to cause serious eye/skin damage or irritation. However, this presumption can be overruled if scientifically valid test data demonstrate that the material does not cause skin or eye corrosion/irritation.

At the same time, the RFSC recognises that certain data gaps remain in the REACH dossiers and is actively working to address them. Additional studies are being prepared, including tests on slags with higher free lime contents, to further strengthen the scientific basis of the registrations.

## 6. Available scientific data on potential inhalation irritation effects

GLP-compliant inhalation studies in rats with ground granulated blast furnace slag (GGBS) (see Table 2), used as a worst-case analogue for ferrous slags (GGBS is usually used in finely ground form), do not cause respiratory irritation or tissue damage. In an acute OECD 403 study at 5,235 mg/m³ - exceeding realistic workplace exposure and the regulatory limit concentration - no mortality and no signs of respiratory irritation were observed, only transient physical dust loading of the nose.

Due to this dust loading and prevention of the animal suffering due to suffocation, a second acute study extended post-exposure observation with lower exposure concentrations was performed. Detailed histopathology confirmed the absence of lung injury, while quartz as positive control induced severe inflammation. A 28-day inhalation study with full examination of all regions of the respiratory tract likewise showed no adverse effects.

Although BOS slags contain some amounts of free CaO, the total dust concentrations already tested with GGBS would, under worst-case assumptions, correspond to or exceed the levels at which CaO-related irritation would be expected, yet no such effects occurred. Testing at even higher dust loads would be technically impossible and ethically unacceptable due to suffocation and particle overload.

Supplementary in vitro studies using lung cell models and covering all registered ferrous slag types, including BOS slags, likewise showed no relevant cytotoxic or pro-inflammatory responses, with results comparable to natural mineral reference materials.

Taken together, the currently available data indicates that BOS and EAF slags are not expected to cause respiratory irritation, making additional animal testing scientifically unnecessary and ethically unjustified under the REACH principle to avoid vertebrate animal testing wherever possible.



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Table 2: Tests conducted using solid slag test item

| | ABS/GBS | EAF-C | EAF-S | BOS | SMS |
|---|---|---|---|---|---|
| Free lime in tested slag | <1% | < 1 % | 2.5% | 2.3 % | 3.3 % |
| **Eye irritation / serious eye damage** | | | | | |
| Eye irritation in vivo (OECD TG 405) | not classified for eye irritation or serious eye damage | not classified for eye irritation or serious eye damage | | | |
| Eye irritation in vivo (OECD TG 405) | | Sample: mix of EAF-C/S<br>Free lime: NA<br><br>not classified for eye irritation or serious eye damage | | Sample: mix of BOS/SMS<br>Free lime: NA<br><br>not classified for eye irritation or serious eye damage | |
| Eye irritation in vitro Hen's Egg Test on the Chorio-Allantoic Membrane Recognized by ECHA to identify substances causing serious eye damage (corrosive) | not corrosive to eyes | not corrosive to eyes | not corrosive to eyes | | |
| **Skin irritation / corrosivity** | | | | | |
| Skin irritation in vivo (OECD TG 404) | Sample: grinded crystalline blast furnace slag<br>Free lime: NA<br>pH: NA<br><br>not classified as skin irritant or corrosive to skin | not classified as skin irritant or corrosive to skin | not classified as skin irritant or corrosive to skin | | |
| Eye irritation in vivo (OECD TG 404) | | Sample: mix of EAF-C/S<br>Free lime: NA<br><br>not classified for skin irritation/damage | | Sample: mix of BOS/SMS<br>Free lime: NA<br><br>not classified for skin irritation/damage | |
| Skin corrosion in vitro (OECD TG 431) | | not corrosive to skin | not corrosive to skin | | |
| **Oral route of exposure** | | | | | |
| OECD 401 In vivo testing on rats Administration of finely ground material in a dose of > 2000 mg/kg body weight | No classification and labeling for acute oral toxicity | No classification and labeling for acute oral toxicity | | No classification and labeling for acute oral toxicity | No classification and labeling for acute oral toxicity |



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Table 3: Tests conducted using slag eluate

| | ABS/GBS | EAF-C | EAF-S | BOS | SMS |
|---|---|---|---|---|---|
| pH value, batch test L/S 10:1 | 11.2 | 11.4 | 12.2 | 11.8 | 11.9 |
| **Eye irritation / serious eye damage** | | | | | |
| Eye irritation in vitro (OECD 437) | | | | No evidence of irritation | No evidence of irritation |
| Eye irritation in vivo (OECD TG 405) | | | No evidence of irritation | No adverse effects on the conjunctiva, cornea and iris were observed | No evidence of irritation |
| Eye irritation in vitro Hen's Egg Test on the Chorio-Allantoic Membrane Recognized by ECHA to identify substances causing serious eye damage (corrosive) | | | No evidence of irritation | | |
| **Skin irritation / corrosivity** | | | | | |
| In vivo skin sensitization guinea pig Buehler test (OECD 406) | Not sensitizing | Not sensitizing | Not sensitizing | Not sensitizing | Not sensitizing |
| In vivo acute dermal irritation/corrosion test (OECD 404) | | | | Not irritant/corrosive | Not irritant/corrosive |
| Human skin model test (EU-method B.46) (eluate after ISO 10993-12) | | | | Not irritant | Not irritant |

Table 4: Tests conducted using solid slags

| | ABS/GBS | EAF-C | EAF-S | BOS | SMS |
|---|---|---|---|---|---|
| | **Inhalation toxicity studies** | | | | |
| Acute inhalation toxicity (OECD TG 403) | Sample: GGBS Test concentration: 5000 mg/m3 (limit test). Mass median aerodynamic diameter: ~ 3 µm. Results: The only clinical signs were reflective of overload with inert particles. | | | | |
| Acute inhalation toxicity (OECD TG 403) | Sample: GGBS Test concentration: 10 and 250 mg/m3 (limit test). Mass median aerodynamic diameter: 2-3 µm. Results: Focus on assessment of dissolution/clearance in the lungs. Exposure was tolerated without specific clinical observations. | | | | |
| Sub-chronic inhalation toxicity study (OECD TG 412) | Sample: GGB Test concentrations: 4, 8 and 24 mg/m3 (aimed at avoiding overload). Mass median aerodynamic diameter: 2-3 µm. Results: no signs of respiratory irritation, merely observations reflective of particle insult and an adaptive response by macrophage clearance. | | | | |
| In-vitro inhalation study | No cytotoxicity<br><br>No inflammatory response | No cytotoxicity<br><br>No inflammatory response | No cytotoxicity<br><br>No inflammatory response | No cytotoxicity<br><br>No inflammatory response | No cytotoxicity<br><br>No inflammatory response |



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Table 5: a selection of examples for performed eco-toxicological tests with slags

| | ABS/GBS | EAF-C | EAF-S | BOS | SMS |
|---|---|---|---|---|---|
| **Aquatic toxicity** | | | | | |
| Short term toxicity to fish (OECD 203) with L/S 10:1 | Not toxic to fish | Not toxic to fish | Not toxic to fish | Not toxic to fish | Not toxic to fish |
| Freshwater toxicity on aquatic invertebrates, Daphnia magna (OECD 202) with L/S 10:1 | Not toxic to aquatic invertebrates | Not toxic to aquatic invertebrates | Not toxic to aquatic invertebrates | Not toxic to aquatic invertebrates | Not toxic to aquatic invertebrates |
| Toxicity to aquatic plants and algae (OECD 201) with L/S 10:1 | No toxicity to aquatic plants | No toxicity to aquatic plants | No toxicity to aquatic plants | No toxicity to aquatic plants | No toxicity to aquatic plants |
| Toxicity to microbial communities in river sediments, long-term toxicity (field study) flow-through field study | | | | No adverse effect on diversity and population density | |
| Toxicity to aquatic microorganisms, activated sludge (OECD 209) with L/S 10:1 | No toxicity | No toxicity | No toxicity | No toxicity | |
| Photobacterium phosphoreum Saltwater static Microtox test | | No toxicity | | | No toxicity |
| **Terrestrial toxicity** | | | | | |
| Toxicity to soil invertebrates, earthworms (OECD 207) with solid slags in different concentrations | No toxicity | No toxicity | No toxicity | No toxicity | No toxicity |
| Toxicity to soil microorganisms, EU Method C.22 (Soil Microorganisms: Carbon Transformation Test) EU Method C.21 (Soil Microorganisms: Nitrogen Transformation Test) | No toxicity | | | No toxicity | No toxicity |
| Toxicity to terrestrial plants (OECD 208) | No toxicity | | | | |
| Toxicity to terrestrial plants, artificial soil (ISO 11269-2 and NF X 31201) | No toxicity | No toxicity | No toxicity | | |

## References

[1] EUROFER – Steel in Figures 2025

[2] www.euroslag.com

[3] www.worldsteel.org

[4] FGSV: Forschungsgesellschaft für Straßen- und Verkehrswesen / German Road and Transportation Research Association: Fact sheet on the use of ferrous slags in road construction.

[5] IDRRIM : Guide des Terrassements des Remblais et des couches de forme (Fascicules 1 et 2) – 2024 (Editions CEREMA) / French Institute for Road Infrastructures : earthworks technical guidelines for embankments and road base layer (Parts 1 and 2) – 2024

[6] NF P 11-213-1-1-1 : Conception, calcul et exécution des travaux de dallage industriel – Décembre 2021 / French technical standard NF P 11-213-1-1-1 : Design, calculation and execution of industrial floors – December 2021

[7] Yin et. al. (2018) Stabilization of free CaO in molten BOF slag by addition of silica at high temperature. Metall. Res. Technol. 115, 414 (2018)

[8] Dowes H., Altherr R. (2012) Oxidation State of the Lithospheric Mantle below the Massif Central, France. Journal of Petrology 55, 2457-2480

[9] EUROSLAG, EUROFER, REACH-Ferrous Slag Consortium (2025): Joint statement against restrictions imposed by the Dutch government on use of Ferrous Slags – Requirements for provisional measures not fulfilled - October 7th, 2025.

[10] Engström, F., Adolfsson, D., Samuelsson, A., Sandström , A., Björkman B.: A study of the solubility of pure slag minerals. Minerals Engineering 41 (2013), S. 46-52

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# Appendix

## Assessment of the Dutch Provisional Restriction on LD and EAF Slags under Article 129 REACH

Analytical data

This appendix provides analytical data on total calcium content, free lime ($CaO_{free}$) and portlandite ($Ca(OH)_2$) in selected LD and EAF slags. It also describes the analytical methods applied for their determination.

The samples presented do not represent the full range of slags produced across Europe. They are provided as illustrative examples to support the analytical discussion.

### Analytical methods used for determination of total calcium, free lime and portlandite:

#### Calcium in the bulk chemical composition

Major and minor components are analysed by X-ray fluorescence (XRF). XRF determines the elemental composition of the sample. For reporting purposes, the elemental concentrations are conventionally recalculated and expressed in oxide notation (e.g., calcium reported as CaO), as this is standard practice in geochemical and mineralogical analysis. Accordingly, in the tables below, the total calcium content is reported as $CaO_{total}$.

Oxide notation reflects the conventional way of presenting elemental composition and does not imply that the element is present as the pure oxide phase. In mineral materials such as natural rocks or slags, elements are incorporated into complex mineral phases (e.g., silicates, ferrites), and do not occur as discrete oxides.

The oxygen associated with each element is not measured directly by XRF but is calculated stoichiometrically based on the assumed oxide form. When results are reported in oxide notation, the calculated oxygen is included in the total, resulting in analytical sums typically close to 100%.

#### DIN EN 1744-1:2009 + A1:2012

According to this method, free lime ($CaO_{free}$) and portlandite ($Ca(OH)_2$) are determined simultaneously using a conductometric procedure. A dry, finely ground sample (<63 µm) is heated under reflux with ethylene glycol (EG). Under these conditions, free lime and portlandite dissolve in the solvent, while the remaining mineral phases are largely unaffected. The electrical conductivity of the resulting solution is measured, and the combined content of $CaO_{free}$ and $Ca(OH)_2$ is quantified using a calibration curve.



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**X-ray diffraction (XRD)**

With this method, the mineralogical phase composition is determined by powder X-ray diffraction with quantitative phase analysis. The sample material is finely ground in an XRD mill in ethanol suspension together with an internal standard (e.g. 10 wt.% rutile). The diffraction pattern is recorded using cobalt radiation at an accelerating voltage of 40 kV and a tube current of 40 mA over an angular range of approximately 10–115° 2θ. Quantitative phase analysis is performed by Rietveld refinement using appropriate software (e.g. Profex/BGMN). Using this approach, crystalline phases such as free lime (CaO) and portlandite ($Ca(OH)_2$) can be distinguished and quantified individually.

**Results:**

The following tables present selected analytical results for BOS and EAF carbon steel (EAF C) slags. The data represent a limited set of samples and analyses and are intended to demonstrate that the applied methods are capable of differentiating and quantifying free lime, as well as illustrating the differences between BOS and EAF C slags.

The samples shown do not represent the full range of slags produced across Europe. In particular, the free lime content in BOS slags may vary between steelworks and production conditions. In contrast, the values observed for EAF C can be considered typical, as free lime is usually absent in these slags.

Table 1: Total calcium (reported as cao by convention), free lime and portlandite in selected LD slags from ten different steelworks

| Nr. | CaO* (XRF) [wt.%] | Free lime +Portlandite (EN 1744-1) [wt.%] | Free lime (XRD-R) [wt.%] | Portlandite (XRD-R) [wt.%] |
|---|---|---|---|---|
| 1 | 45,5 | 7,2 | 4,0 | 2,7 |
| 2 | 47,1 | 8,3 | 6,4 | 0,9 |
| 3 | 48,6 | 8,3 | 6,1 | 0,8 |
| 4 | 44,1 | 9,6 | 4,9 | 4,9 |
| 5 | 43,6 | 3,6 | 2,4 | 0,7 |
| 6 | 42,6 | 7,0 | 4,1 | 1,4 |
| 7 | 45,0 | 1,3 | <1 | <1 |
| 8 | 48,9 | 7,4 | 4,8 | 0,9 |
| 9 | 35,8 | 6,5 | 3,4 | 1,5 |
| 10 | 40,7 | 3,4 | 2,5 | 1,5 |



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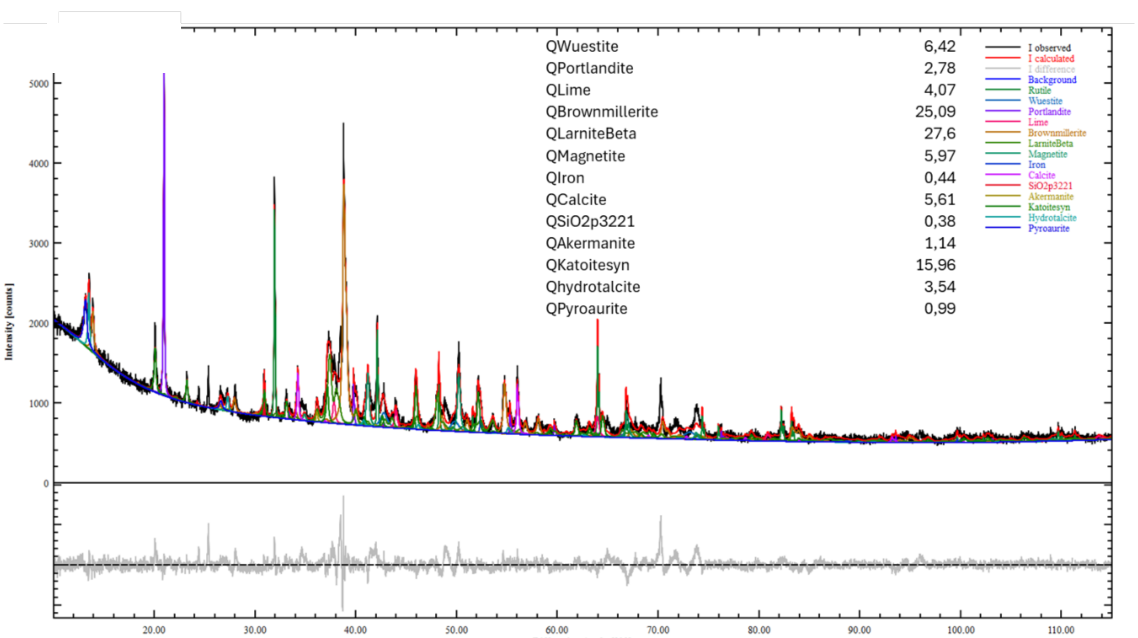
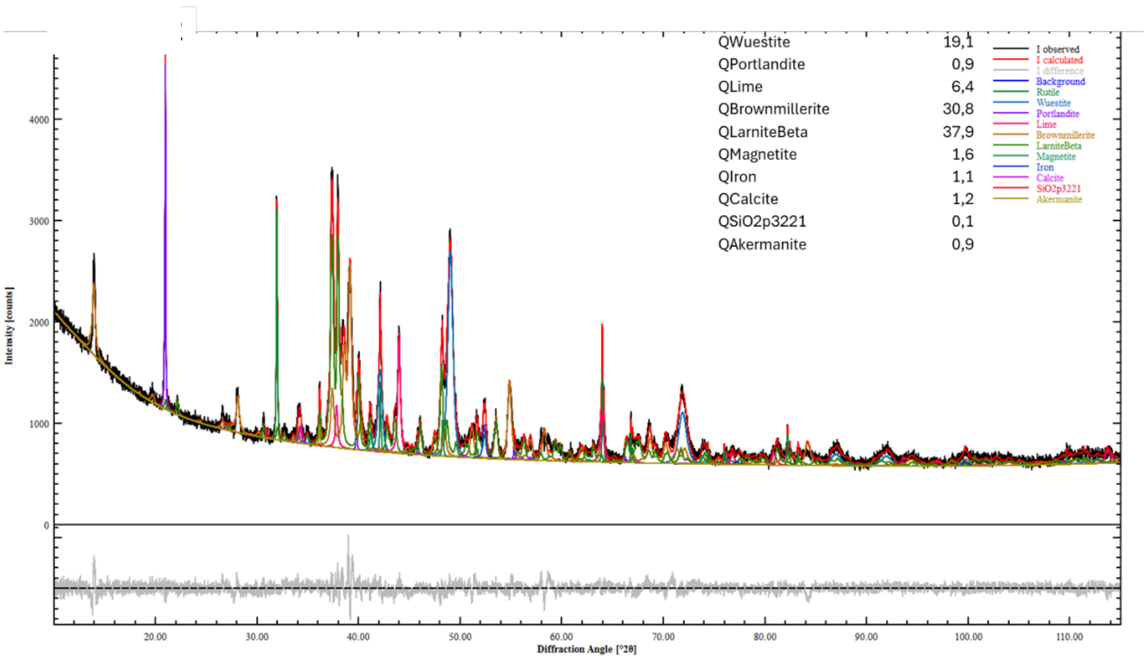
Table 2: Total calcium (reported as cao by convention), free lime and portlandite in EAF C slags from ten different steelworks

| Nr. | CaO* (XRF) [wt.%] | Free lime +Portlandite (EN 1744-1) [wt.%] | Free lime (XRD-R) [wt.%] | Portlandite (XRD-R) [wt.%] |
|---|---|---|---|---|
| 1 | 23,4 | <0,2 | < LOQ | < LOQ |
| 2 | 23,0 | <0,2 | < LOQ | < LOQ |
| 3 | 26,2 | <0,2 | < LOQ | < LOQ |
| 4 | 27,2 | <0,2 | < LOQ | < LOQ |
| 5 | 28,4 | <0,2 | < LOQ | < LOQ |
| 6 | 22,9 | <0,2 | < LOQ | < LOQ |
| 7 | 19,3 | <0,2 | < LOQ | < LOQ |
| 8 | 18,4 | <0,2 | < LOQ | < LOQ |
| 9 | 29,5 | <0,2 | < LOQ | < LOQ |
| 10 | 33,1 | <0,2 | < LOQ | < LOQ |

LOQ = *Limit of Quantification*

## X-Ray Diffraction diagrams – LD slags (BOS)

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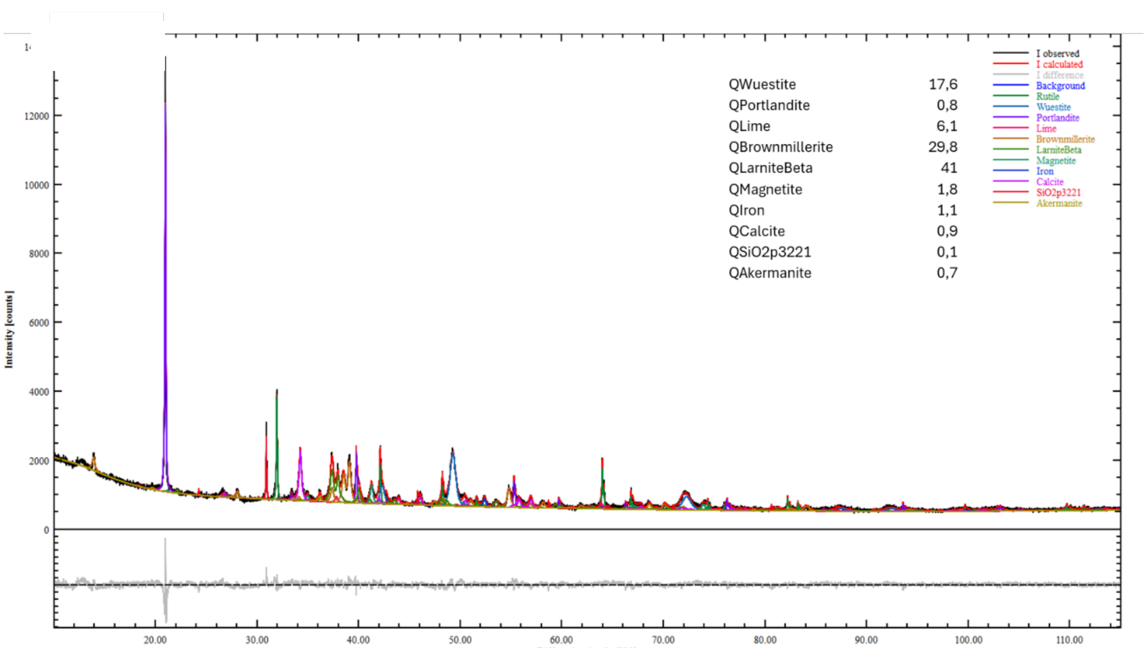
QIron 1,1
QCalcite 1,2
QSiO2p3221 0,1
QAkermanite 0,9
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
4000
3000
2000
1000
0
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Diffraction Angle [°2θ]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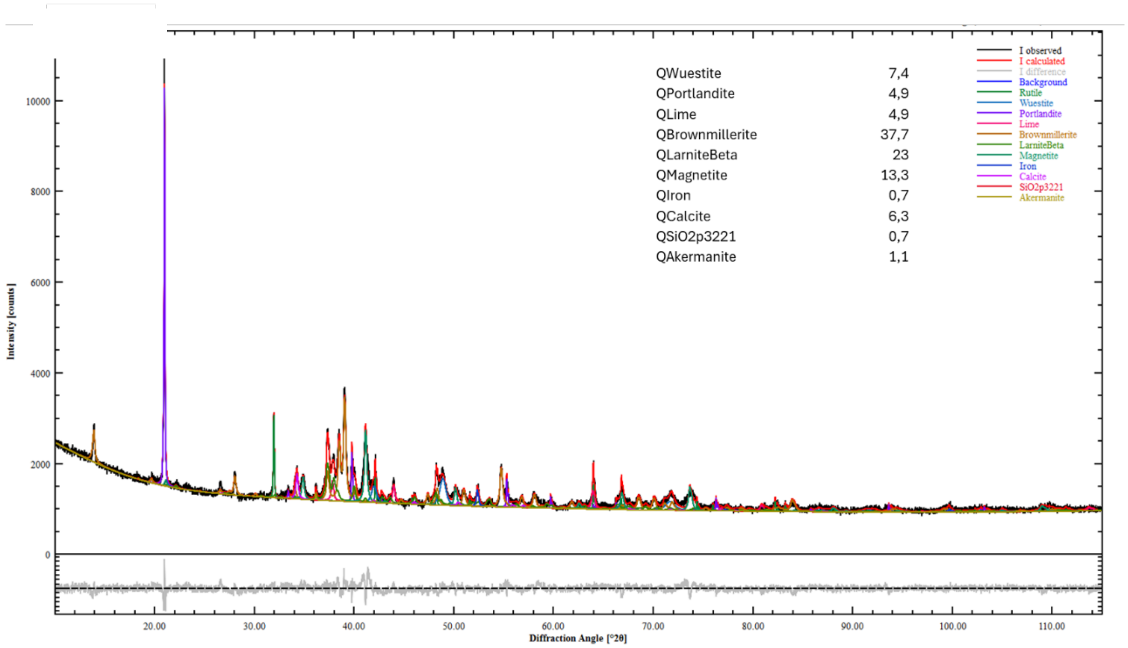
QCalcite 0,9
QSiO2p3221 0,1
QAkermanite 0,7
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
12000
10000
8000
6000
4000
2000
0
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Diffraction Angle [°2θ]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QLarniteBeta 23
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QIron 0,7
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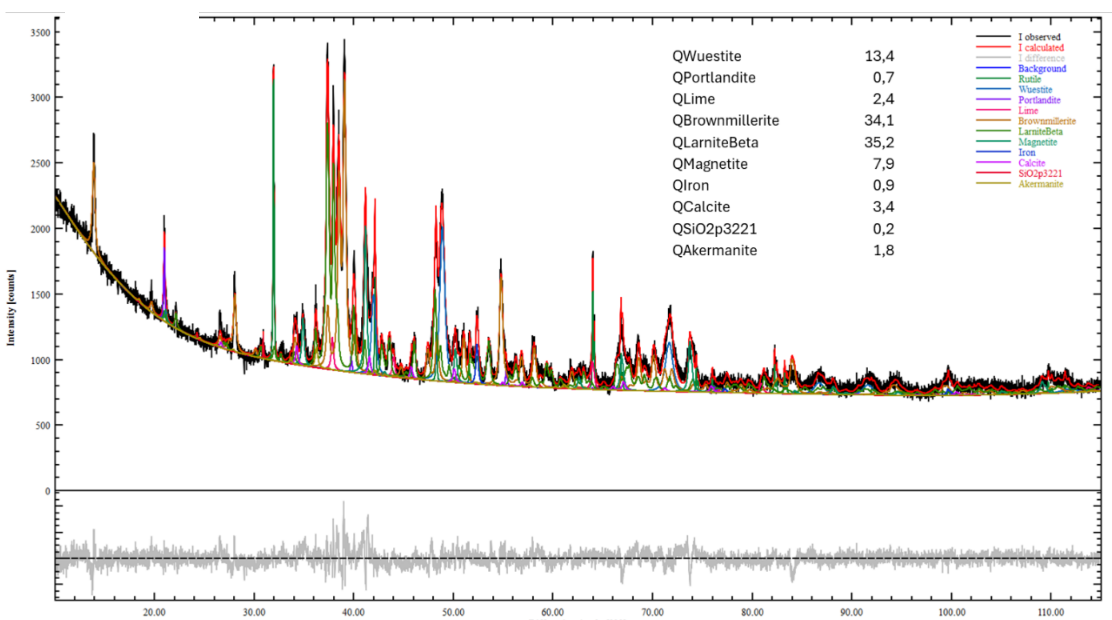
QSiO2p3221 0,7
QAkermanite 1,1
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
Diffraction Angle [°2θ]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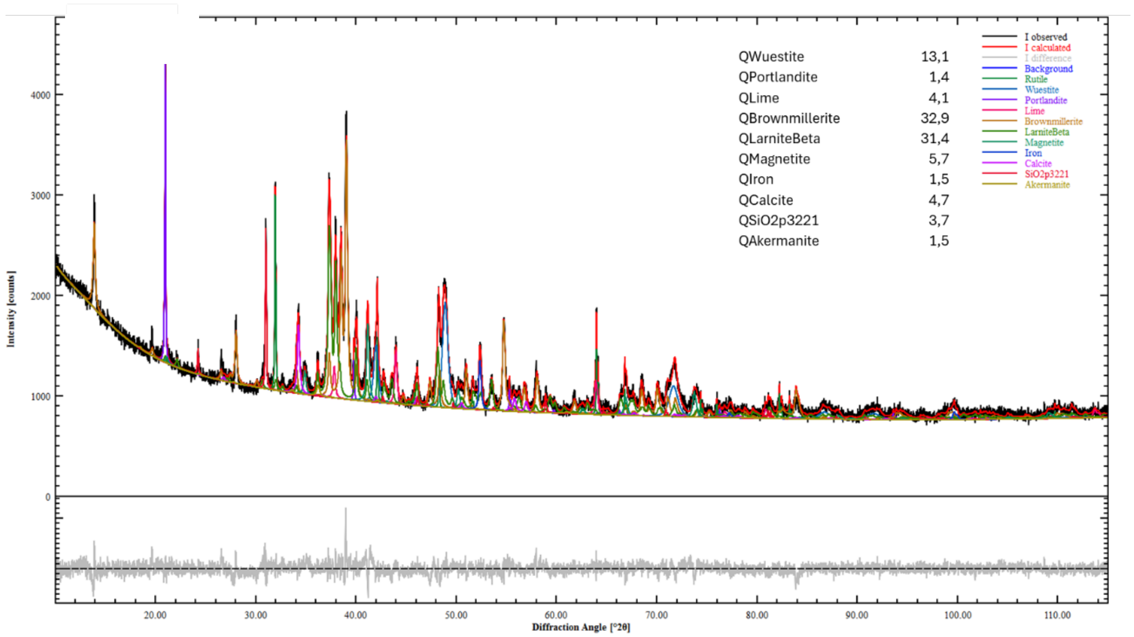
QIron 0,9
QCalcite 3,4
QSiO2p3221 0,2
QAkermanite 1,8
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
Diffraction Angle [°2θ]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QLarniteBeta 31,4
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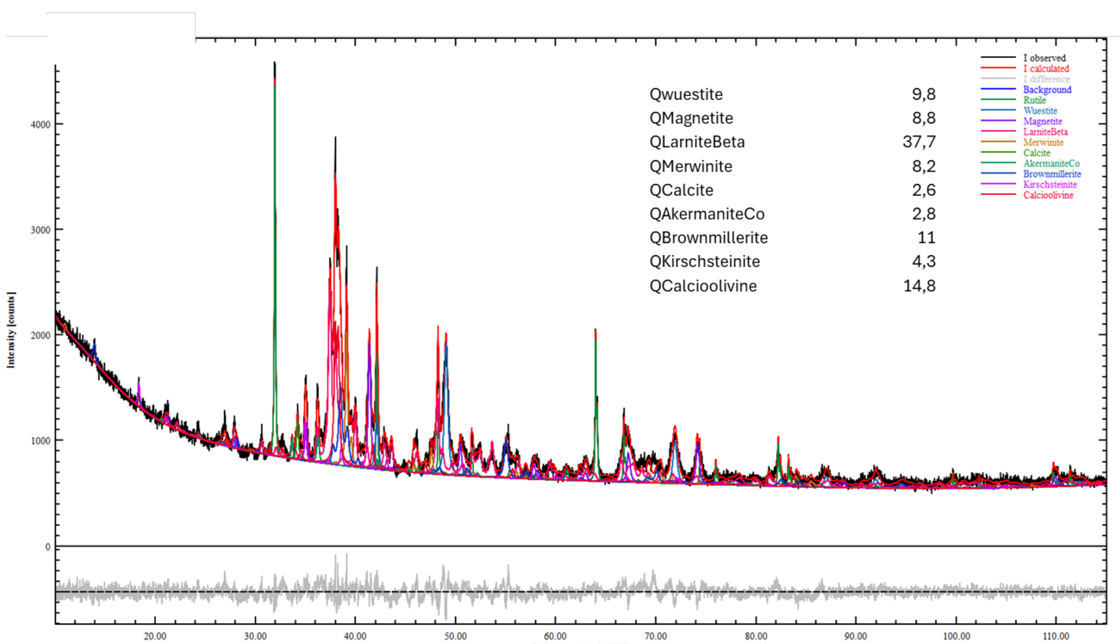
QIron 1,5
QCalcite 4,7
QSiO2p3221 3,7
QAkermanite 1,5
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
4000
3000
2000
1000
0
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Diffraction Angle [°2θ]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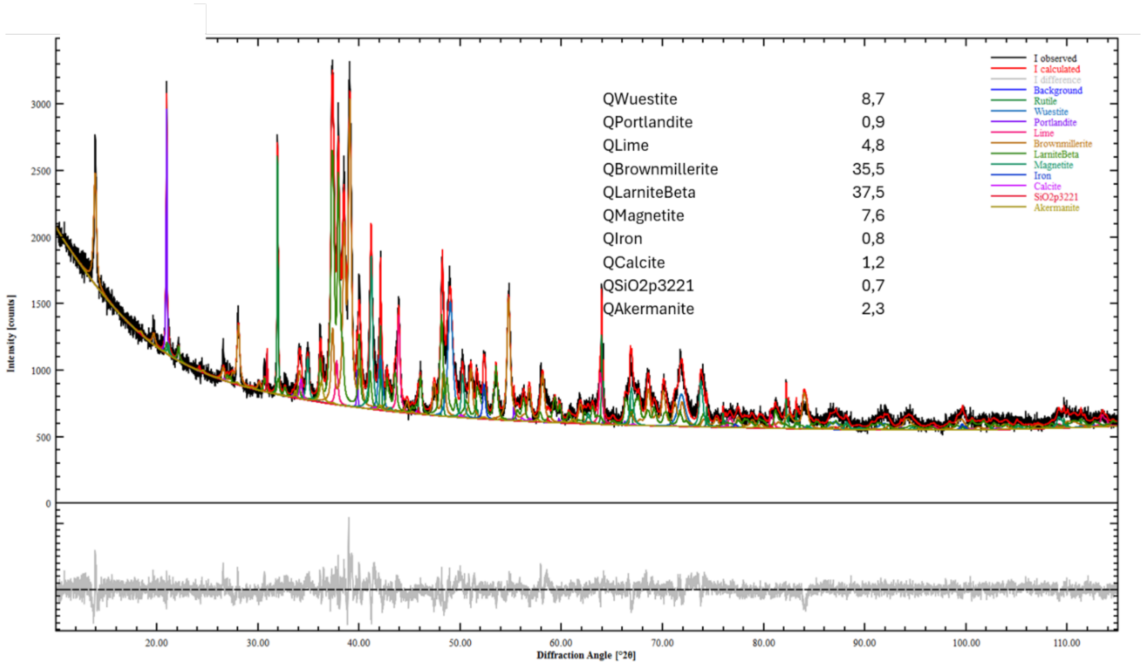
QCalcite 2,6
QAkermaniteCo 2,8
QBrownmillerite 11
QKirschsteinite 4,3
QCalcioolivine 14,8
I observed
I calculated
I difference
Background
Rutile
Wuestite
Magnetite
LarniteBeta
Merwinite
Calcite
AkermaniteCo
Brownmillerite
Kirschsteinite
Calcioolivine
Intensity [counts]
4000
3000
2000
1000
0
20.00
30.00
40.00
50.00
60.00
70.00
80.00
90.00
100.00
110.00
Diffraction Angle [°2θ]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QLime 4,8
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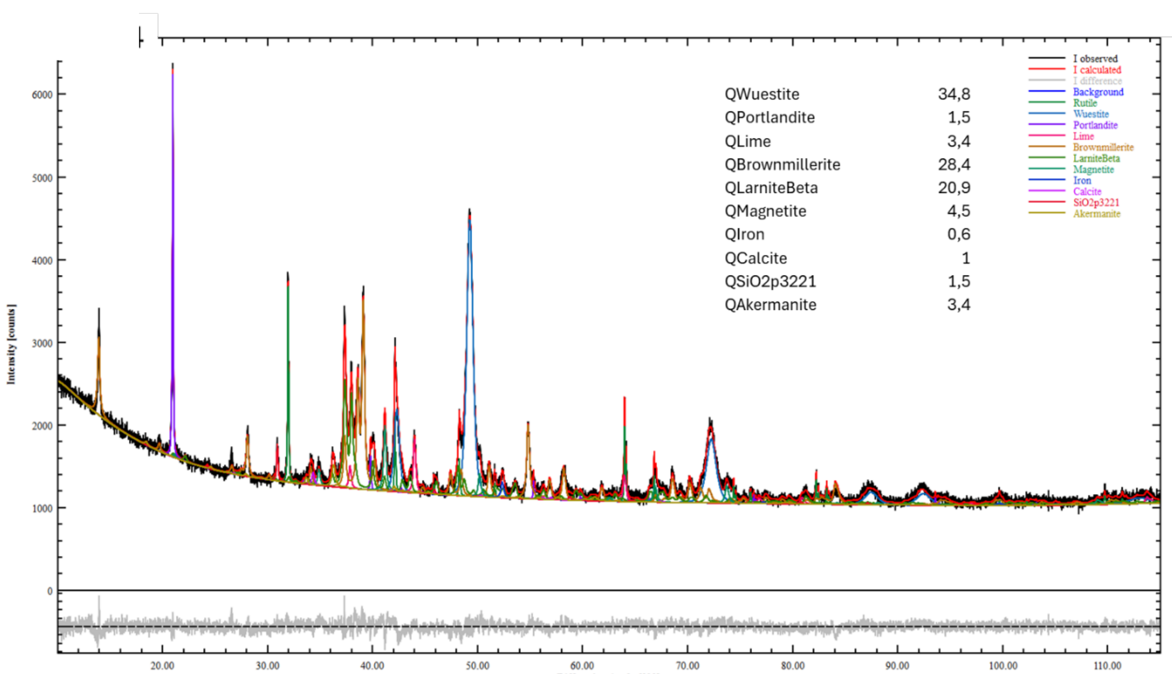
QLarniteBeta 37,5
QMagnetite 7,6
QIron 0,8
QCalcite 1,2
QSiO2p3221 0,7
QAkermanite 2,3
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
Diffraction Angle [°2θ]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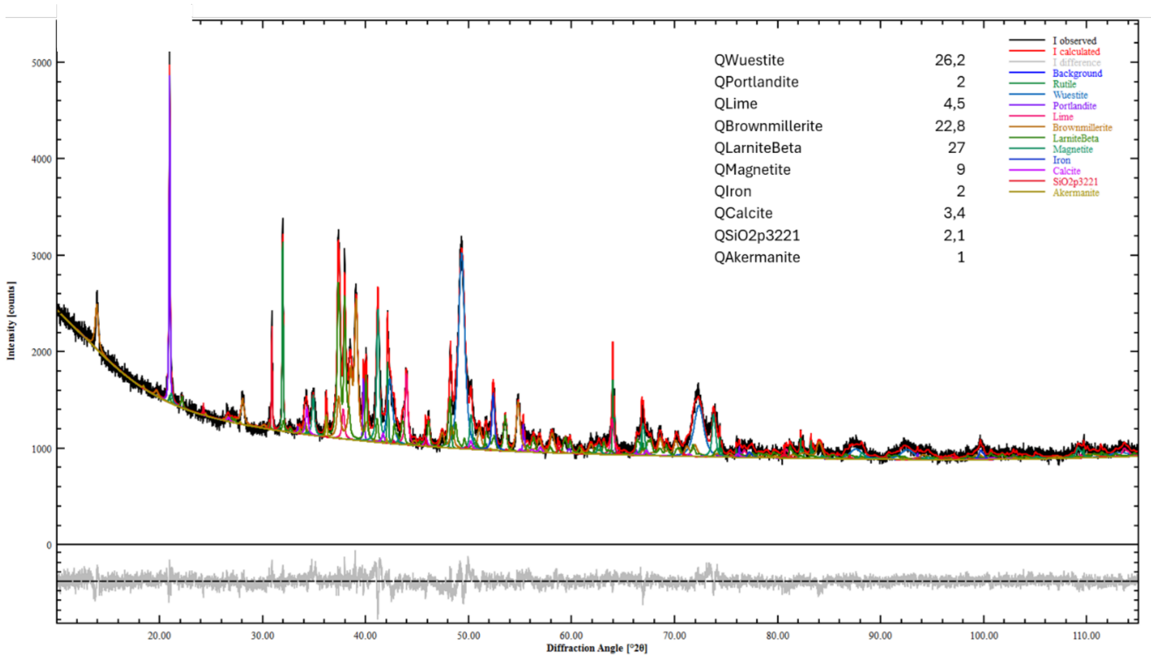
QLarniteBeta 20,9
QMagnetite 4,5
QIron 0,6
QCalcite 1
QSiO2p3221 1,5
QAkermanite 3,4
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
Diffraction Angle [°2θ]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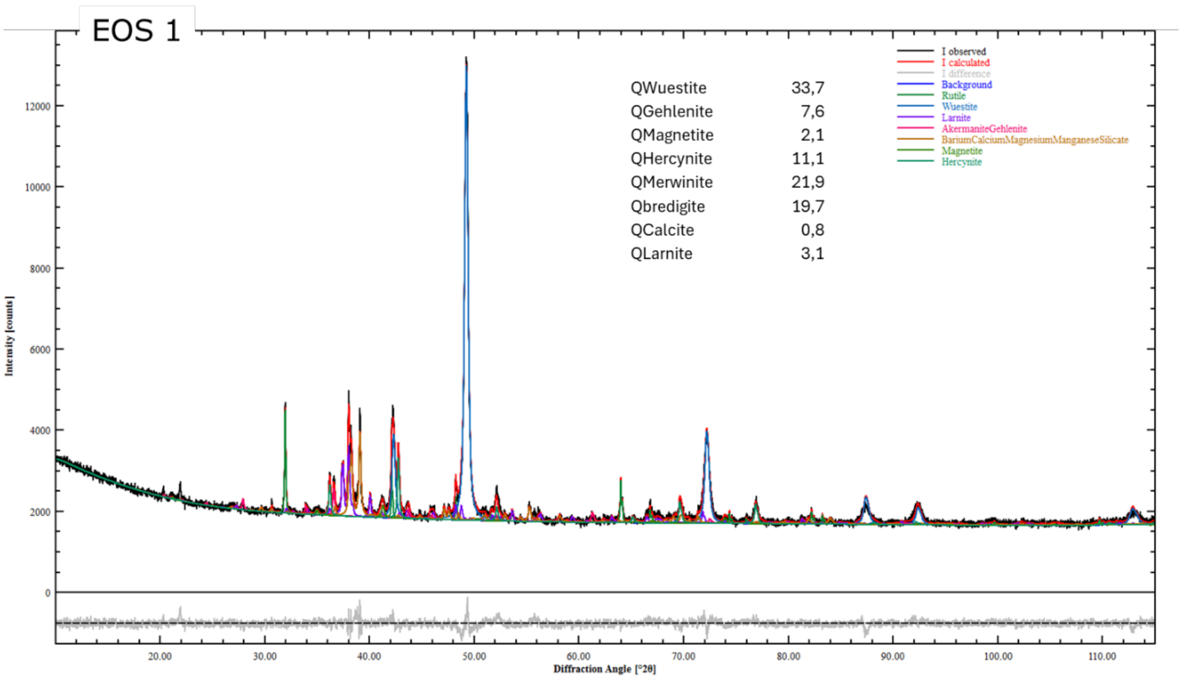
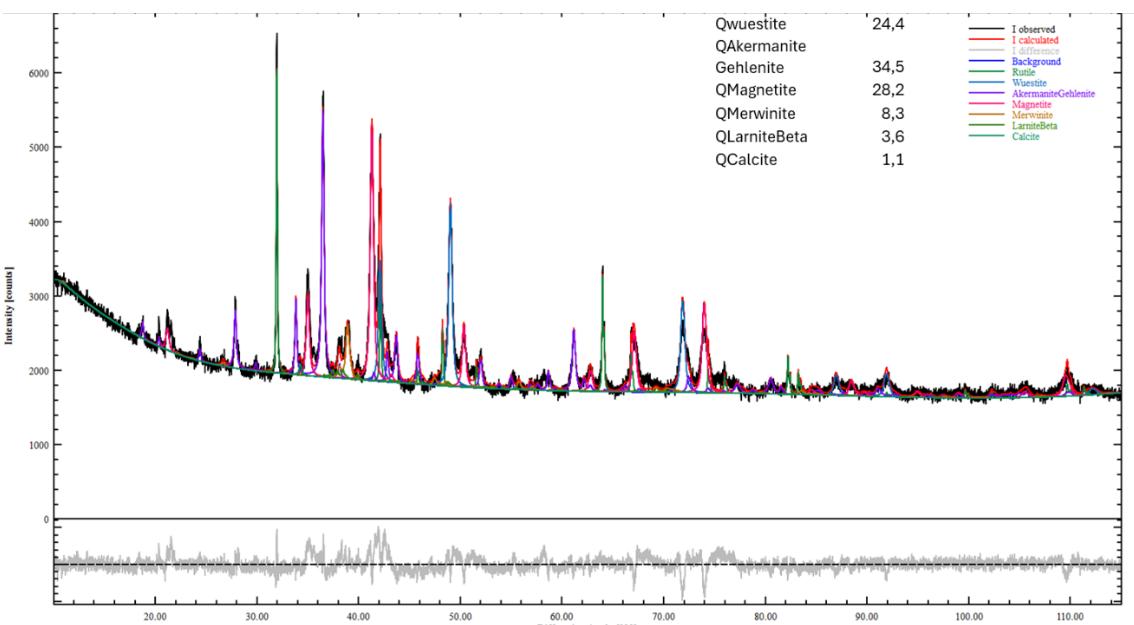
QLarniteBeta 27
QMagnetite 9
QIron 2
QCalcite 3,4
QSiO2p3221 2,1
QAkermanite 1
I observed
I calculated
I difference
Background
Rutile
Wuestite
Portlandite
Lime
Brownmillerite
LarniteBeta
Magnetite
Iron
Calcite
SiO2p3221
Akermanite
Intensity [counts]
Diffraction Angle [°2θ]

## X-Ray Diffraction diagrams - EOS





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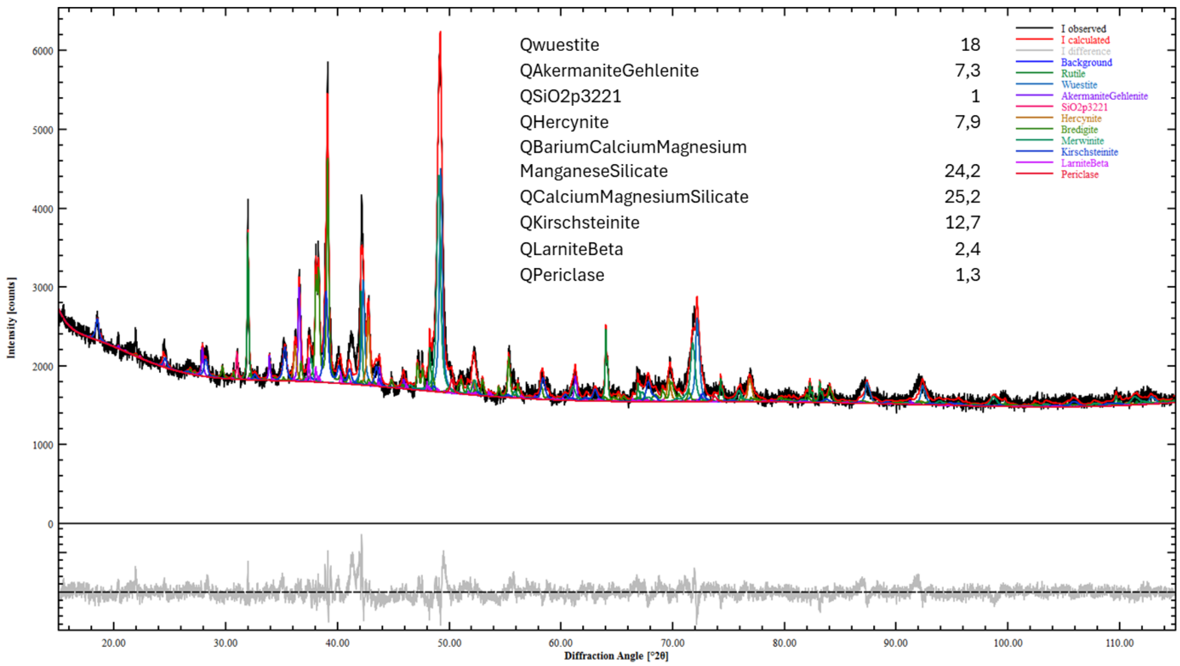
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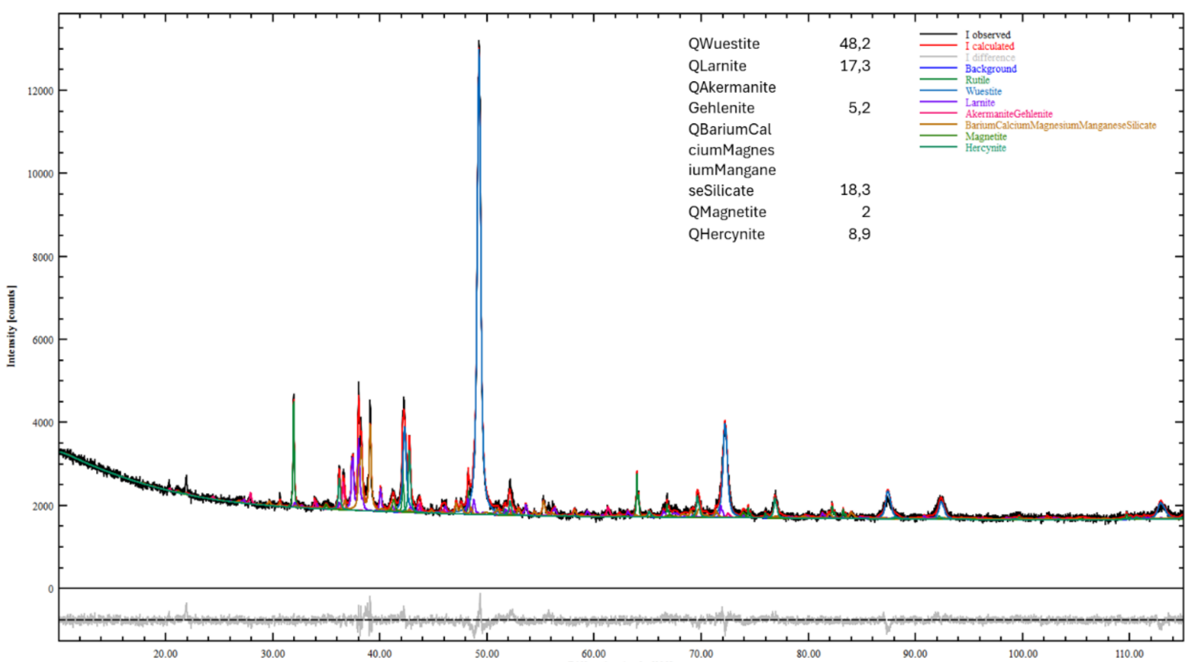
QSiO2p3221 1
QHercynite 7,9
QBariumCalciumMagnesium
ManganeseSilicate 24,2
QCalciumMagnesiumSilicate 25,2
QKirschsteinite 12,7
QLarniteBeta 2,4
QPericlase 1,3
I observed
I calculated
I difference
Background
Rutile
Wuestite
AkermaniteGehlenite
SiO2p3221
Hercynite
Bredigite
Merwinite
Kirschsteinite
LarniteBeta
Periclase
Intensity [counts]
Diffraction Angle [°2θ]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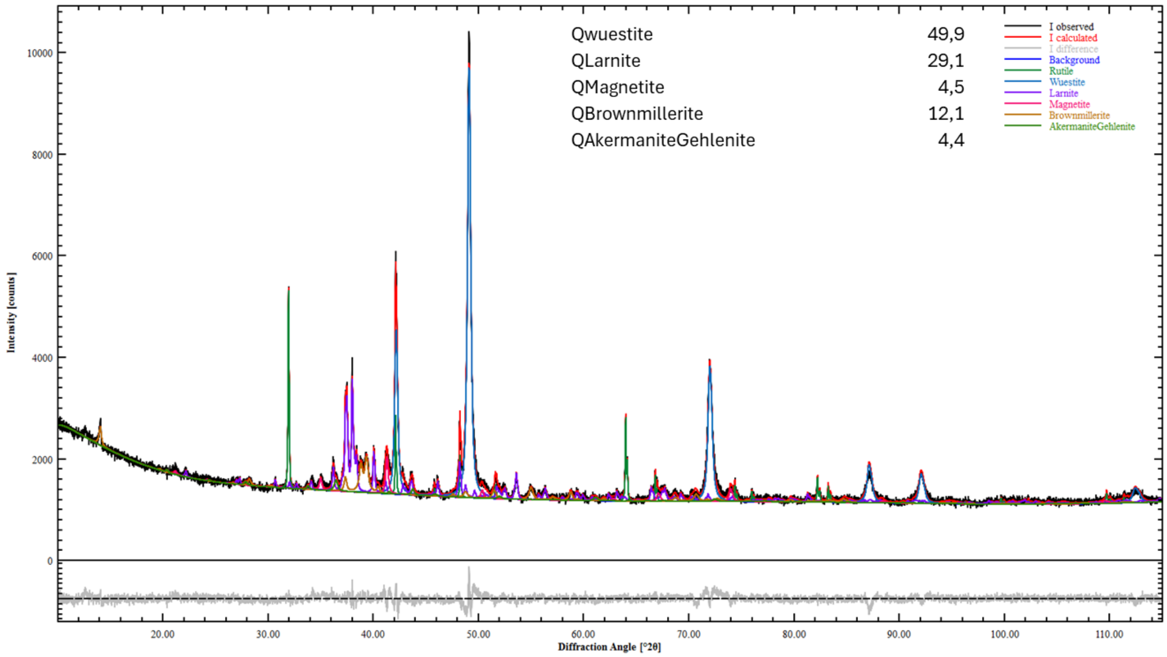
QAkermanite
Gehlenite 5,2
QBariumCal
ciumMagnes
iumMangane
seSilicate 18,3
QMagnetite 2
QHercynite 8,9
I observed
I calculated
I difference
Background
Rutile
Wuestite
Larnite
AkermaniteGehlenite
BariumCalciumMagnesiumManganeseSilicate
Magnetite
Hercynite
Intensity [counts]
Diffraction Angle [°2θ]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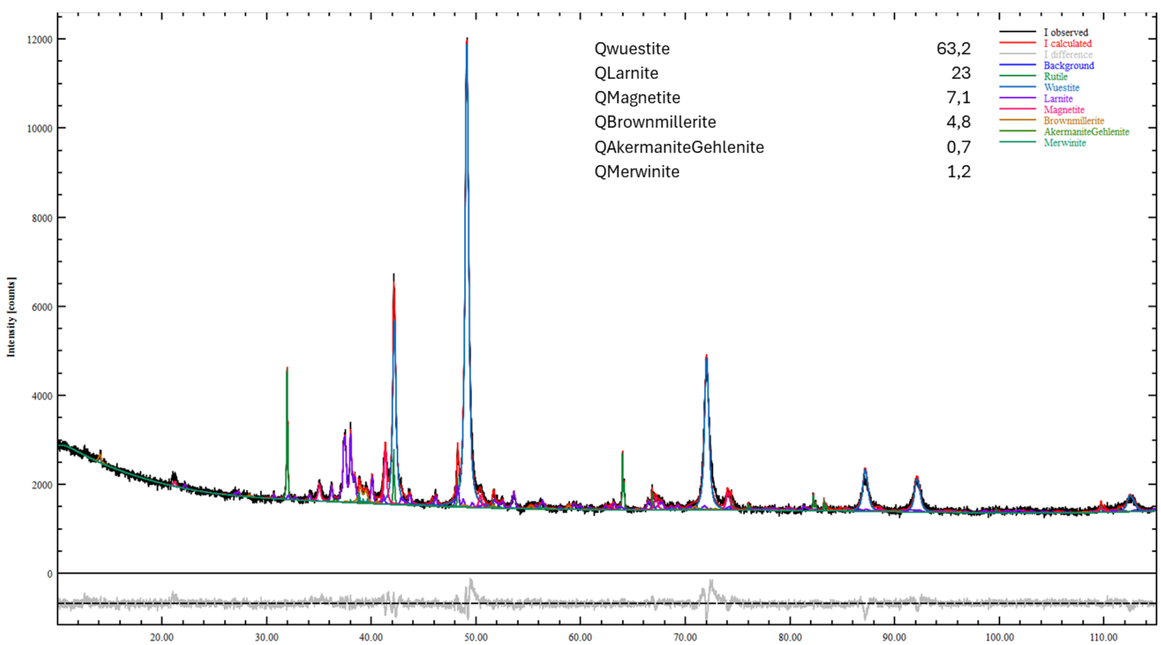
QLarnite 29,1
QMagnetite 4,5
QBrownmillerite 12,1
QAkermaniteGehlenite 4,4
I observed
I calculated
I difference
Background
Rutile
Wuestite
Larnite
Magnetite
Brownmillerite
AkermaniteGehlenite
Intensity [counts]
Diffraction Angle [°2θ]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QMagnetite 7,1
QBrownmillerite 4,8
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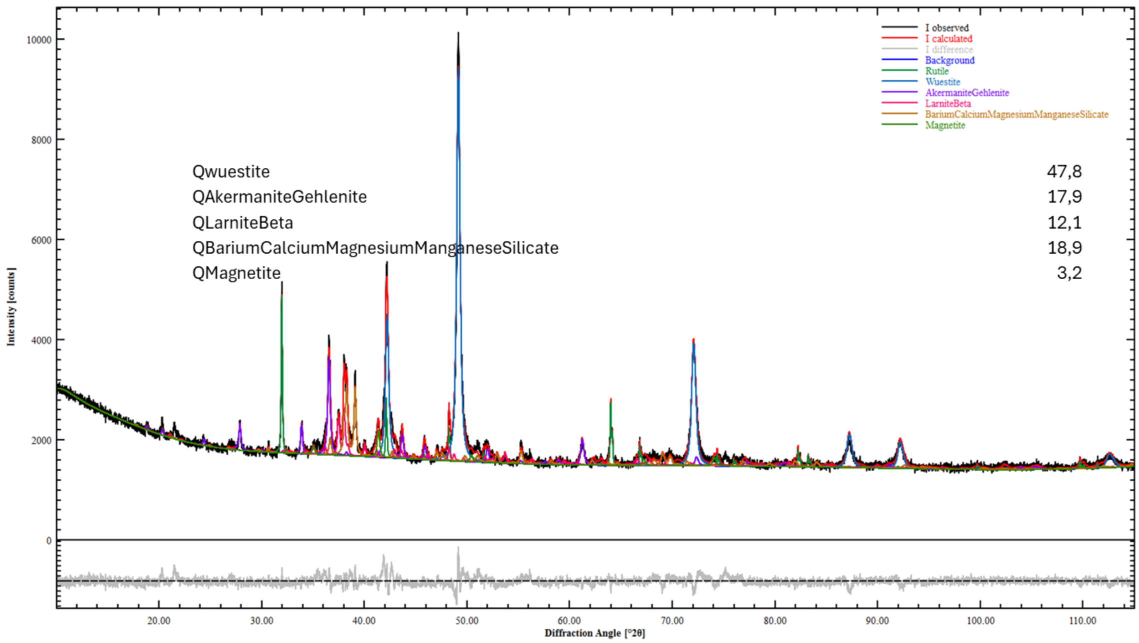
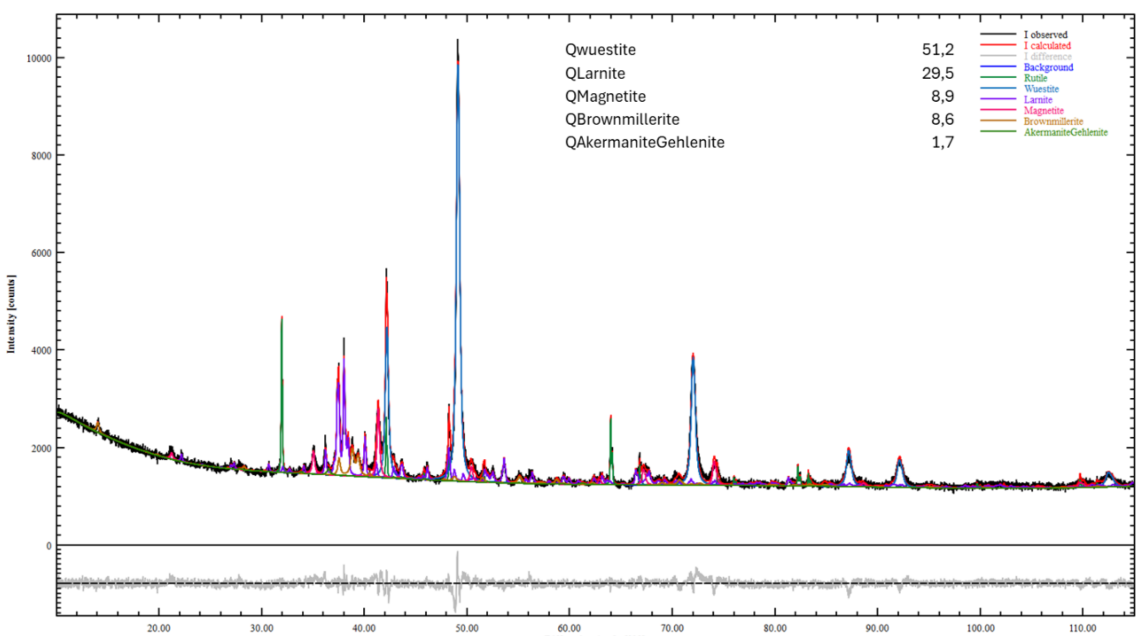
QMerwinite 1,2
I observed
I calculated
I difference
Background
Rutile
Wuestite
Larnite
Magnetite
Brownmillerite
AkermaniteGehlenite
Merwinite
Intensity [counts]
Diffraction Angle [°2θ]


I observed
I calculated
I difference
Background
Rutile
Wuestite
AkermaniteGehlenite
LarniteBeta
BariumCalciumMagnesiumManganeseSilicate
Magnetite
Qwuestite 47,8
QAkermaniteGehlenite 17,9
QLarniteBeta 12,1
QBariumCalciumMagnesiumManganeseSilicate 18,9
QMagnetite 3,2
Intensity [counts]
Diffraction Angle [°2θ]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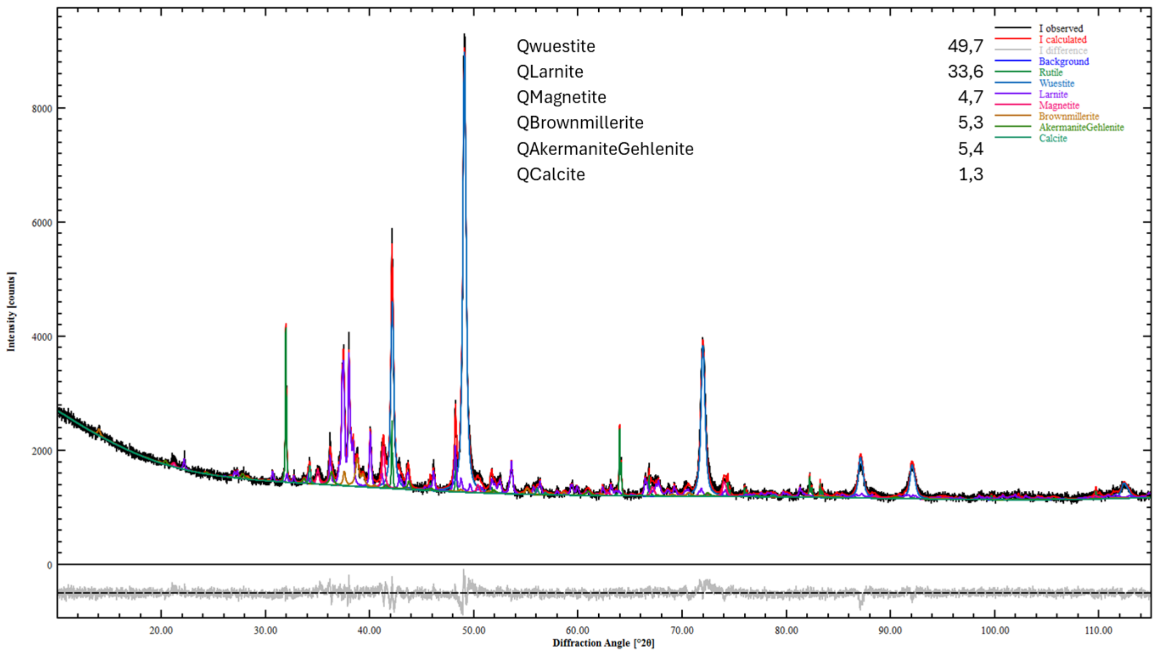
QBrownmillerite 8,6
QAkermaniteGehlenite 1,7
I observed
I calculated
I difference
Background
Rutile
Wuestite
Larnite
Magnetite
Brownmillerite
AkermaniteGehlenite
Intensity [counts]
Diffraction Angle [°2θ]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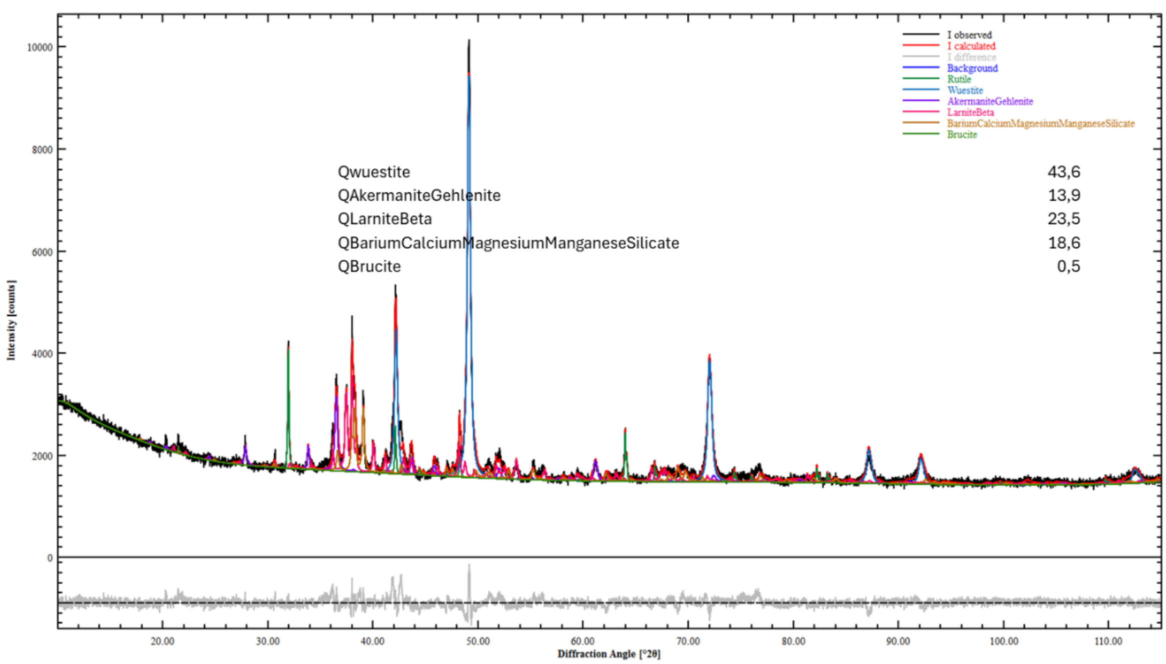
QLarnite 33,6
QMagnetite 4,7
QBrownmillerite 5,3
QAkermaniteGehlenite 5,4
QCalcite 1,3
I observed
I calculated
I difference
Background
Rutile
Wuestite
Larnite
Magnetite
Brownmillerite
AkermaniteGehlenite
Calcite
Intensity [counts]
Diffraction Angle [°2θ]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QLarniteBeta 23,5
QBariumCalciumMagnesiumManganeseSilicate 18,6
QBrucite 0,5
I observed
I calculated
I difference
Background
Rutile
Wuestite
AkermaniteGehlenite
LarniteBeta
BariumCalciumMagnesiumManganeseSilicate
Brucite
Intensity [counts]
Diffraction Angle [°2θ]

## 1. Introduction

In addition to the joint statement of EUROSLAG, EUROFER, and RFSC submitted in October 2025 [1], we would like to provide necessary technical and scientific clarification and objection regarding the updated information presented by the Netherlands in February 2026 to the Commission and REACH-Committee in the current procedure following Article 129 REACH. Furthermore, we would like to discuss legal aspects concerning the Dutch provisional measure and the ongoing procedure.

We fully share the objective of ensuring a high level of protection of human health and of the environment in the use of secondary raw materials and by-products. However, the additional information provided by the Netherlands does not demonstrate the existence of an urgent and significant risk requiring provisional national measures under Article 129 REACH. In short: **The Netherlands do not provide any "justifiable grounds" that are mandatory required by Article 129 (1) of REACH regulation.**

The information presented by the Netherland relate primarily to local incidents, specific application conditions and implementation practices. They do not establish a serious and uncontrollable intrinsic risk of LD and EAF slag as a material. The justification relies largely on precautionary assumptions and hypothetical mechanisms rather than on demonstrated causal relationships supported by robust scientific or circumstantial evidence.

Accordingly, the conditions for approval under Article 129 REACH are not fulfilled. We therefore respectfully propose that the provisional measure should not be approved. This is critically important because approval would, pursuant to Article 129 (3) REACH, require the initiation of a Union restriction procedure, with far-reaching consequences for the European steel industry, recycling and by-product markets and circular economy as well as climate change objectives. These socio-economic and regulatory implications are set out in more detail below.

## 2. Socio-economic implications of the Dutch measure

The following sections outline the socio-economic implications of the Dutch measure, first at European level (Section 2.1) and subsequently with specific reference to the Netherlands (Section 2.2). The figures and considerations for the EU as a whole are relevant for assessing the Dutch national restriction under Article 129 REACH. They cannot be disregarded on the grounds that this is "only" a provisional national measure. This aspect will be outlined further below under Section 5.1 of this document.

### 2.1 Implications in Europe

Ferrous slags are valuable by-products of the steel industry which are inevitably produced along with the steel. Ferrous slags have been used for over 100 years in Europe and in downstream industries which has avoided 1.21 billion tons of natural rock extraction and prevented 319 million tons of $CO_2$ emissions over the 2000-2024 period [2, 3].

In the year 2024, 36 million tons of ferrous slags were produced in the EU and UK: 19.6 million tons of ABS/GBS, and 16.5 million tons of Steel furnace slag, including BOS (~60 %) and EAF (~30 %). While ABS/GBS were mainly used in Cement Production, BOS and EAF were used on different markets, such as road construction (61 %), hydraulic engineering (4.7 %), fertilizers (8.1 %), recycling into metallurgical processes (12.1 %), and cement/concrete additives (12.3 %) [2, 3, 4].

Many of the well-established uses of ferrous slags in the member states fall within the scope of the Dutch restriction. If the NL-provisional measure would be upheld and a respective regular restriction would be implemented, it would create disproportionate economic consequences and disrupt the EU's slag market. If slags must be landfilled instead of being used, disposal costs of € 50–150/t would burden the EU steel industry with € 0.8–2.55 billion annually only for 16.5 million tons of BOS und EAF slags.

Allowing such measures would also significantly limit slag marketability and create disadvantages for the European steel industry. It would disrupt EU steel production as no steel can be produced without ferrous slag. It would also adversely affect recycling and by-product value chains, increase dependency on primary raw materials, raise $CO_2$ emissions and therefore thwart fundamental goals of circularity and sustainability (Green Deal and Circular Economy policy).

### 2.2 Implications in Netherlands

In 2024, Tata Steel IJmuiden produced approximately 1,200 kilo tons of GBS and 575 kilo tons of BOS. Nearly all produced GBS are utilized in cement production. BOS slag, however, has a more diversified application profile: 100 kilo tons is used in cement and concrete, 515 kilo tons in civil engineering works such as road construction, and 120 kilo tons is recycled internally in the BOF process for metallurgical purposes [5].

Due to recently imposed Dutch restrictions on the use of steel slag in civil engineering applications, the market of BOS in such works within the Netherlands has effectively come to a halt. Since slag formation is inherent to steelmaking, alternative outlets must be found. Identifying new applications is challenging due to the need for technical validation and market development, as well as uniformity in European, national and regional laws and regulations. These constraints carry significant implications for Tata Steel IJmuiden, the Netherlands' sole steel producer and employer of 9,000 people.

## 3. General observations on the Dutch justification

The Dutch justification [6] does not meet the requirements of Article 129 REACH. The Netherlands have not provided any justifiable grounds for believing that urgent action is necessary to protect human health or the environment in respect of LD slag. The reasons for this conclusion are explained in detail below.



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### 3.1 Character of the evidence presented

The Dutch submission is exclusively:

- Incident-based,
- application-dependent,
- characterised by acknowledged uncertainty,
- based on hypothesised mechanisms, but not on demonstrated causal relationships or on circumstantial evidence for such relationships,
- largely reliant on precautionary assumptions, but not on the legally necessary verified exposure scenarios,
- lacking quantitative exposure and monitoring data,
- not supported by reproducible analytical evidence,
- based on case-specific observations, but not on systematic assessment,
- linked to non-compliance with certified conditions of use,
- methodologically insufficient to establish a systemic, substance-specific intrinsic hazard.

The justification repeatedly uses formulations such as "may occur", "could lead to", or "considered possible". This linguistic framing indicates unreliable speculations of risk rather than evidence-based confirmation of harm under defined conditions of use.

Precautionary language alone **does not** establish:

- a serious and uncontrollable risk,
- an urgent situation requiring emergency intervention, or
- an intrinsic hazardous property of the material.

Importantly:

- Uncertainty does not equal a serious and urgent risk.
- Local incidents do not demonstrate systemic hazard. Isolated or context-specific events cannot be extrapolated to a generalised risk without evidence of reproducibility and scale.
- Application errors do not establish intrinsic substance hazard. Misuse, incorrect installation, or failure to comply with technical specifications must be distinguished from hazards inherent to the material itself.

To substantiate the Dutch conclusions, a regulatory assessment would require reproducible and verifiable data demonstrating causality, exposure pathways and concentration characterization, and a clear exceedance of risk acceptance thresholds under realistic use scenarios.

Overall, the Dutch arguments are at the level of "alternative facts" which cannot withstand the hurdle of justifiable grounds according to Article 129 (1) of REACH.



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### 3.2 Incidents that triggered the NL restriction

The incidents cited in pages 4-5 of the Dutch justification [6] do not demonstrate a systemic, substance-intrinsic risk.

In the cases described in ILT report [7]:

- No quantified exposure data are provided,
- No robust causal analysis is presented,
- Contextual factors (such as design, hydrology, soil conditions, compliance with use conditions other relevant materials, substances, factors, actors and causal relationships) are insufficiently considered.

#### Case 1 – Spijk

This "case report" is of only secondary nature: The local health authority GGD Gelderland-Zuid reported an individually experienced nosebleeds by a single person directly to ILT [7] (The Netherlands Human Environment and Transport Inspectorate); however, in the report [7] a causal link between the health complaint and the steel slag used for groundwork on a golf course could not be established.

Regarding the elevated pH value in water and soil contamination, after an inspection and thorough risk assessment of the site, it was concluded by the inspectors that the contractor has deviated from the conditions of use formulated by the supplier in product certificate, therefore indicating a non-compliant application. Land subsidence had caused contact of LD slags with ground water – a scenario explicitly prohibited under the product specifications. During installation, relevant soil characteristics and site hydrology were not adequately considered.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

#### Case 2 – Hellevoetsluis

In the TV programme De Vuilnisman [8] residents near Hellevoetsluis reported health complaints during an excavation project, including nosebleeds, irritation of skin, eyes and respiratory tract, and one alleged case of skin burns. The RIVM report [8] speculated that these effects were "almost certainly" caused by elevated quicklime (CaO) levels in LD steel slag. However, this conclusion was not supported by any analytical measurements of airborne concentrations, dermal exposure quantification, or a documented concentration-effect-based assessment. The attribution therefore remains inferential rather than evidence based. No proof of circumstantial evidence was given for the merely speculation of the wording "almost certainly".

Subsequently, according to the ILT report [7] and RIVM report [9], the supervisory authority DCMR identified elevated pH levels in local water bodies and concluded that the contractor had not complied with the conditions of use specified in the NL-BRL product certificate which was provided by the supplier of LD-slags. The ILT report states that "no soil protection measures (cloth, foil, etc.) were taken" and further: "Since this concerns an embankment under a road construction, the applicant should have taken into account a rainwater drainage system with gutters, drains, and sewers. This was not done. Furthermore, the LD steel slag was not used as an embankment under a road construction but directly as a road in use." (p. 22 of the ILT report [7]). Following a preliminary relief ruling, the LD slag was removed and the original situation restored. The Council of State held that the contractor had breached the statutory duty of care under Article 7 Besluit bodemkwaliteit (Bbk) and Article 13 Wet bodembescherming (Wbb), specifically in relation to the improper construction of a rainwater drainage system adjacent to the pavement. Therefore, the case is an example of installation errors and non-compliance to the conditions of use indicated in product certificate.

Additionally, regarding soil contamination, the ILT report [7] states on page 22 explicitly:

> "Based on the above arguments, it is concluded that the application of steel slag **did not lead to soil contamination**." (emphasis added)

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

### Case 3 – Oude Tonge

At this location, puddles of water with elevated pH value have been reported in areas that LD slags have not been covered with protective foil according action plan specific to this installation. In a limited number of monitoring points, higher pH values were reported for ground water after covering the layer with protective foil. However, according to ILT report [7], page 24,

> "Studies by TAUW and Deltares into the groundwater **do not show any clear significant causal link** with the applications of the LD steel slag, which have been covered for some time now" (emphasis added).

It was concluded that the applied covering foil was previously not adequately maintained. This was noted on several occasions (see page 24 of ILT report [7]). The competent authority had imposed an order subject to a penalty for non-compliance requiring the LD steel slag to be covered and remain covered with foil. This indicates a clear case of faulty installation and maintenance, but no intrinsic or systematic risk of LD slags concluded on reliable scientific (circumstantial) evidence.

The available findings do not establish a substantiated hydrogeological impact attributable to the material itself. They do not demonstrate that LD steel slag, when applied and maintained in compliance with prescribed technical requirements, poses any intrinsic or systematic environmental risk. The case concerns non-adherence to protective measures, not a substance-inherent hazard or risk.



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**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

### Case 4 – Eerbeek

The cited reference for this case is a newspaper article in de Volkskrant [10], which does not provide analytical data, exposure monitoring results, or information on potential confounding co-exposures. It also lacks essential contextual details such as the number of affected individuals or their distance from the site.

In contrast, according to a report cited by AfvalOnline [11], the competent authority — the Municipal Health Service (GGD) of North and East Gelderland — concluded that, based on new investigations, the uncovered steel slag at the Doonweg landfill in Eerbeek likely **poses no health risk** to nearby residents in short or long term. The authority further indicated that potential exposure concerned volatile organic compounds (VOCs), with expected effects limited to odour perception (e.g. hydrogen gas), which may cause anxiety-related stress rather than toxicological health effects. The ILT report [6] states on page 31 that concentrations of barium, chromium, sodium, chloride, strontium, and vanadium which were higher in the shallow groundwater than the average concentrations in the monitoring wells located upstream, were probably caused by

> "an error in estimating the collection capacity."

This statement already suggests that the observed concentrations may be linked to hydraulic or collection-related effects rather than to the intrinsic properties of the applied BOS slags. However, the report does not provide quantitative information on the actual magnitude of the reported exceedances. It also does not clarify whether the observations merely reflect local accumulation effects resulting from collection ditch deficiencies.

More fundamentally, the assessment of pH values and heavy metal concentrations is not sufficiently substantiated from a scientific and hydrogeological perspective. The reported values are neither quantified in detail nor compared to natural background concentrations in soil and groundwater. No evaluation is made as to whether the detected levels are environmentally or toxicologically relevant.

Furthermore, the report does not provide essential hydrogeological context. There is no mapping of monitoring wells in relation to the slag application areas, no presentation of hydraulic heads or groundwater flow directions, and no contouring or site-specific hydrogeological assessment. Without this information, a causal link between the observed groundwater concentrations and the use of BOS slags cannot be established.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**



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### Case 5 – Werpsterhoek road junction (city of Leeuwarden)

Elevated pH in seepage water has been reported. However, the documentation reflects attribution by assumption but not a structured scientific risk evaluation establishing causality. The observed alkalinity is linked to the use of LD slags without a comprehensive assessment of site-specific geohydrological conditions, background soil chemistry, or the potential contribution of other construction materials present at the site.

The ILT report [7] simply states on page 40:

> "It is now **almost certain** that the layer containing the LD steel slag has become completely saturated with (rain)water."

and further

> "Research is also currently being conducted into the ditch bed, surface water, and groundwater. An update of the (water) soil investigations **has yet to be prepared** and has **not been received during the course of this investigation**." (emphasis added).

It is clear from the vague statements that no reliable causal relationship has been established, but that the statements are **based purely on unreliable assumptions**. According to the ILT report [7], pH value tests were carried out, but apparently no further tests.

A scientifically robust evaluation would have required hydro-chemical characterisation, source apportionment, temporal monitoring data, and differentiation between anthropogenic and natural alkaline inputs. Such analysis has not been presented. Instead, the report repeatedly acknowledges that the investigation is incomplete and that the connection between LD slags and the measured pH values remains an assumption.

Additionally, the conditions of use in the relevant product certificate (K42785/04) – which is cited by the ILT report [7] on page 39 – clearly states that untreated discharge water run-off into the surface water or sewer must be prevented. The conclusion of the ILT report that information from Rijkswaterstaat showed that there were "no indications that the LD steel slag was used in violation of the conditions of use" is clearly **incorrect and deliberately misleading**.

The case cannot substantiate an intrinsic or systematic hazard or risk; it highlights, at most, a potential deviation from prescribed application conditions combined with unresolved investigative gaps.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**



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### Case 6 – Haak om Leeuwarden Noord

According to ILT report [77], page 37, "verbal explanations have revealed that there have been problems in the past with a subsiding embankment on Harlingerstraatweg due to calcareous water seeping out of the embankment".

However, the same report further states that whether the LD slags cause elevated pH values is still not clear:

> "It is currently **unclear** whether there is water in the LD steel slag package and whether there is leaching of water with elevated pH or metals. Monitoring of the groundwater on site had yet to be started during the ILT visit (September 18, 2024)." (emphasis added)

No conclusive determination was presented and so far, there is no hydrogeological assessment demonstrating a transport pathway and chemical fingerprint linking the LD slag to the observed alkaline conditions. Essential elements of an environmental risk assessment (including source–pathway–receptor analysis, quantitative monitoring data, and evaluation of alternative explanations) are not provided. The ILT report [7] states on page 38, that the situation is still being investigated by Rijkswaterstaat.

Consequently, this case offers no evidentiary value from a scientific perspective. It documents observations and merely hypotheses but does not establish causal linkage or intrinsic or systematic hazards or risks caused by LD slags. The available information remains highly speculative and does not meet the threshold required for substantiated hazard or risk characterisation.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

### Case 7 – Strobosser Trekfeart

This case is at most an example of faulty engineering design as admitted in the ILT report [7], page 26:

> "Due to greater than expected settlement, the bottom of the LD steel slag package ended up in the groundwater over time."

This outcome directly contradicts the conditions laid down in the relevant product certificate provided by the supplier, which explicitly prohibits contact with groundwater and recommends consultation with competent authorities regarding site-specific conditions of use. The conclusion of the ILT report [7] (page 25) that information from the province of Fryslân showed that there were "no indications that the LD steel slag was used in violation of the conditions of use" is clearly **deliberately misleading**.

Accordingly, the case demonstrates non-compliance with prescribed application constraints and engineering misjudgment. It does not establish that the generic, compliant use of LD slags poses an intrinsic or systematic hazard or risk.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

### Case 8 – Falomster Faert waterway

In this case, the information provided in the ILT report [6] on page 27 indicates that the construction and drainage concept was not implemented as foreseen, which reportedly resulted in seepage water with elevated pH values. The application was subject to specific conditions of use under the applicable product certificate.

This points to deficiencies in the implementation of the site-specific construction and water-management measures rather than to an intrinsic, systematic, or unavoidable hazard associated with LD steel slag when used in accordance with certified conditions. Temporary alkaline seepage water in construction settings is a known and manageable phenomenon for alkaline mineral materials, including cement-bound materials and concrete, and does not in itself demonstrate systemic environmental risk.

Regarding the reported groundwater findings, elevated concentrations of nickel and barium are mentioned. However, the measured pH values and metal concentrations are neither quantified in detail nor compared with site-specific hydrogeological background levels or legally binding environmental quality standards. Moreover, no evidence is provided demonstrating that the detected metal concentrations originate from the LD steel slag. In particular, nickel is not a characteristic indicator parameter for LD steel slag, and no substantiated evidence is presented establishing that the measured metal concentrations are attributable to the LD steel slag.

**In the absence of quantified data, background comparison, threshold assessment, and source attribution, the case does not establish a serious or immediate risk to human health or the environment and does not provide sufficient grounds for urgent measures under Article 129 (1) REACH.**

### Case 9 – Aagtenpark/Aagtenbelt landfill

There has been a report of elevated pH in seepage water from Aagtenpark/Aagtenbelt landfill. However, the available documentation does not present a quantitative comparison between the measured pH values and relevant background levels or control sites where LD slags were not used. Without such baseline information, the interpretation of the reported alkalinity remains systematically incomplete. A structured scientific risk evaluation is not provided, and the



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documentation does not establish a clear causal relationship between the presence of LD steel slag and the observed pH values.

Additionally, the IRL [1] report mentions on page 34:

> "The water found may also originate from a **false groundwater table in the landfill**. This can also cause water to leak through the cover layers. According to the RIVM, this must be taken into account. Furthermore, according to the RIVM, there is a possible explanation for the interpretation of pH control measurements by TAUW. **The moment of measurement can influence the measurement result**. After heavy rainfall, an apparent groundwater table can feed percolate emissions from the landfill body for a long time, but this will decrease over time. In the meantime, the water continues to absorb CO2 from the air, making the pool less alkaline (depending on its buffering capacity)." (emphasis added)

This case demonstrates (again) that no causal chain between LD slag and the observed circumstances has been established; the reported alkalinity could equally result from other site-specific hydrogeological conditions, measurement timing, or other environmental factors, and no evidence-based risk assessment has been conducted to substantiate a material-related hazard or risk caused by LD slag.

**The case is not suitable for demonstrating that urgent action is necessary or only appropriate to protect human health or the environment. The case does not provide any justifiable grounds according to Article 129 (1) REACH.**

**Conclusion**

A closer review of all nine individual cases cited by the Dutch justification [6] demonstrates that they **do not provide (circumstantial) evidence** of a systemic or substance-intrinsic hazard or risk associated with LD steel slag. Across the reported incidents, **no scientifically substantiated causal relationship between the observed effects and the presence or use of LD steel slag can be established**. The available documentation consistently lacks the methodological elements required for a proper evidence-based risk assessment.

In particular, the cases do not provide quantified exposure data, reproducible analytical measurements, or robust causal analyses linking the material to the reported observations. Essential components of environmental and toxicological evaluation (such as source-pathway-receptor analysis, baseline comparisons, hydrogeological characterisation, exposure or dose assessment) are absent in all instances. Without these elements, attribution of the reported effects to LD steel slag remains unsubstantiated.

Furthermore, several cases explicitly acknowledge that investigations were incomplete or that competent authorities could not establish causality. In addition, at least in cases 1 (Spijk), 2 (Hellevoetsluis), 3 (Oude Tonge), 5 (Werpsterhoek road junction), 7 (Strobosser Trekfeart) and 8



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(Falomster Faert waterway) the conditions of use specified in the relevant product certificates provided by the supplier, or the statutory requirements were not adhered to by the contractors responsible for installation. Requirements relating to covering, prevention of contact with rain- or groundwater, drainage design, and other technical safeguards were frequently not implemented or not adequately maintained. Consequently, a number of the reported observations occurred under conditions that deviate greatly from the certified and intended use of the material. Such circumstances relate to implementation practices but not to an intrinsic risk from use of the material itself. Assuming that the observations can be causally attributed to LD steel slag (which is not the case), they could have been avoided if the material had been used or installed in accordance with the relevant regulations respectively with the relevant product certificate.

With the exception of two locations, where isolated health complaints were reported, no human health effects were observed or documented. Even in those cases, competent authorities concluded that a causal relationship or even a clear correlation with LD steel slag could not be confirmed. Similarly, in cases involving elevated pH values in water bodies, the available documentation does not include comparative baseline data, monitoring before and after removal of the material, or site-specific hydro-chemical analysis that would be necessary to demonstrate a causal linkage.

Furthermore, the single cases 2 (Hellevoetsluis), 3 (Oude Tonge) and 4 (Eerbeek) provide evidence – just on the contrary to the Dutch justification [6] – that there is no risk of soil contamination respectively groundwater contamination respectively no risk to nearby residents' health in short or long term even if LD steel slag is used under improper conditions as it was the case in each individual case.

Overall, the cited cases rely on assumptions, media reports, or preliminary observations but not on systematic scientific investigation. Consequently, the presented examples must completely be assessed as speculative allegations but not as (circumstantial) evidence-based demonstrations of risk. The nine cases do not substantiate in any way that the compliant use of LD steel slag leads to intrinsic or systematic environmental or health hazards or risks.

### 3.3 Focus of the Dutch justification on application conditions but not on intrinsic material properties

As already demonstrated in the assessment of the individual incidents in Chapter 3.2, the information provided in the Dutch justification [6] predominantly relates to specific application scenarios, installation conditions and site characteristics, rather than to intrinsic properties of the material itself.

The reported issues are consistently linked to factors such as installation geometry and construction layout, water management and drainage design, unintended contact with groundwater, local hydrogeological characteristics. These elements reflect how and where the material is used, rather than demonstrating that the material itself inherently poses a risk across typical applications.

Such considerations are relevant for the design, installation and management of construction works and are normally addressed through application conditions, engineering controls and enforcement of existing environmental or construction rules. **They do not**, in themselves, **demonstrate that the substance requires restriction under REACH**, which focuses on risks arising from intrinsic hazardous properties that cannot be adequately controlled through other regulatory instruments.

# 4. Dutch reasoning for three measures and weak points

## 4.1 Alkalinity and pH-related effects

The Netherlands argue on page 3 of the justification document [6] that hydration of free lime ($CaO$) and periclase ($MgO$) may generate alkaline leachates with adverse environmental effects.

Several clarifications are necessary because the Dutch document is not accurate regarding the following:

*(a) Differentiation between slag types*

While BOS/LD slags may contain free lime, it is important to distinguish between different slag types. In particular, EAF slags from carbon steel production generally do not contain free lime, as the lime added during the steelmaking process is largely incorporated into stable mineral phases (see Fact Sheet on Ferrous Slags, Chapter 1 [12]).

With regard to $MgO$ (periclase), it should be noted that:

Where magnesium is present it is predominantly incorporated within stable mineral phases. Reactive periclase is not present in LD lag and may occur in other slag types depending on process conditions and raw material composition; however, it cannot be assumed as a generic characteristic of all steel slags. Additionally, $MgO$ hydrates to magnesium hydroxide ($Mg(OH)_2$), which is sparingly soluble, significantly lower than that of $Ca(OH)_2$ [e.g. 13].

*(b) Total CaO versus free lime*

The use of total calcium (scientific notation given as total $CaO$) content as an indicator of hazard is not scientifically appropriate. In metallurgical slags, most of the calcium is incorporated in stable mineral phases and does not represent a reactive fraction relevant for environmental behaviour. Total calcium content therefore does not provide a meaningful basis for assessing potential environmental effects.

*(c) Exposure-dependent pH value development*

Even where free $CaO$ is present, pH value development depends on liquid-to-solid ratio (L/S), grain size, drainage design and encapsulation. The Dutch justification [6] argues on page 1 that elevated pH values may alter soil chemistry and thereby mobilise certain metals. While it is scientifically correct that pH value can influence metal mobility, this effect is highly site-specific and depends on soil buffering capacity, mineral composition, redox conditions and hydraulic regime. The mere theoretical possibility of mobilisation does not demonstrate an intrinsic, uncontrollable risk from use of LD slags itself.

In Germany, these processes have been systematically investigated over more than two decades in over 40 publicly funded research projects [14, 15]. These studies included large-scale field trials, lysimeter experiments, long-term column studies and geochemical modelling across a wide range of soil types and hydrogeological settings. The research specifically examined leaching behaviour, transport processes, sorption mechanisms and the interaction of substitute construction materials with different soil environments.

The results of these research programmes form the scientific basis of the German Ersatzbaustoffverordnung (EBV, Substitute Building Materials Act) [16]. The EBV establishes binding material-specific limit values for eluates and defines installation classes and use conditions derived from site-relevant exposure scenarios and transport modelling.

Compliance with the EBV requirements ensures that, when materials are tested and used in accordance with the regulation, protection of soil and groundwater is maintained. The regulatory framework also accounts for pH-dependent processes and the potential mobilisation of metals under realistic field conditions ensured. The regulatory framework also accounts for pH-dependent processes and the potential mobilisation of metals under realistic field conditions.

In addition, it is to be kept in mind that measured pH values in eluates are strongly dependent on the L/S. Any assessment of “high pH” effects therefore requires specifying the L/S basis and relating it to realistic infiltration conditions.

The existence of such a scientifically substantiated regulatory framework demonstrates that potential pH-related mobilisation effects are controllable through defined application rules and do not constitute an intrinsic and uncontrollable hazard within the meaning of Article 129 REACH.

### 4.2 Direct human exposure

The argument put forward by the Dutch that human exposure through inhalation of resuspended material, dermal contact, and ingestion can pose a risk is based on a precautionary interpretation of potential exposure pathways but does not establish a demonstrable causal risk attributable to LD slag as a material.

From a regulatory and scientific perspective, several methodological and legal shortcomings can be identified:

First, the reasoning reverses the basic structure of risk assessment. Under established regulatory practice in environmental and chemical safety law, risk results from the interaction of hazard and exposure. The mere existence of theoretical exposure pathways such as inhalation, dermal contact, or hand-to-mouth ingestion does not in itself demonstrate a health risk. Exposure must be assessed together with reliably established hazardous properties under realistic conditions of use. In this regard, the available evidence does not support the assumption that LD slag intrinsically presents the alleged hazards.

Second, the reports cited by the Dutch justification [6] rely largely on hypothetical worst-case exposure scenarios while failing to show such exposures occurred under proper installation, compliant, and properly managed applications. In practice, human exposure is strongly influenced by controllable engineering and construction parameters, including construction design, compaction, and maintenance. These parameters are addressed through product certification and national legislation governing construction materials, soil and water protection. Where such conditions are properly implemented, the likelihood of direct contact or dust exposure is significantly reduced.

Third, the reference to possible irritation from alkaline construction materials does not by itself justify regulatory intervention specific to LD or EAF slag. Many common construction materials exhibit alkaline properties without posing a health risk under normal conditions of use. Restriction based on irritation potential must therefore be supported by evidence of harmful effects (proven hazardous property) under realistic exposure conditions, not merely by theoretical contact pathways.

Fourth, the cited studies (RIVM and TAUW [17, 18]) highlight potential exposure pathways but do not demonstrate a confirmed hazard, nor do they provide quantitative exposure data showing that harmful exposure occurs under compliant applications. The TAUW study [176] for the use for Duomix does conclude (with reference to the RIVM of cycle paths in Drenthe) on page 16 and 17:

- "The human risk limit value for vanadium is not exceeded in either soil or groundwater."
- "Assessment of the scenarios 'living with a garden' and 'nature' shows that there are no human risks."
- "Occupational health and safety risks cannot be directly assessed, but it is expected that there are no risks, provided that standard safety measures are taken and the material is moistened, if necessary, in case of drought."
- "The effects on the wider ecosystem, including larger animals (including domestic animals) and birds, are considered negligible."
- "Based on the concentrations in groundwater, there are no risks to drinking water extraction."
- "The above considerations show that ingestion does not a priori lead to unacceptable risks."

In summary, the available information indicates that potential exposure pathways are being interpreted as evidence of risk by the Netherlands without first establishing the presence of a relevant hazard or demonstrating realistic exposure under compliant conditions of use. Where exposure might theoretically occur, it is largely determined by controllable construction and design parameters that are already addressed in product certification and existing regulatory frameworks.



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Consequently, the argument presented does not sufficiently demonstrate that the application of LD slag as such creates an intrinsic risk requiring additional emergency regulatory measures.

### 4.3 Metal leaching

The concerns regarding metal leaching outlined by the Netherlands relate primarily to potential exposure scenarios and environmental processes. However, the reasoning presented does not sufficiently demonstrate that use of LD slags can lead to intrinsic risks that would justify regulatory intervention. From a scientific and regulatory perspective, several aspects require clarification.

The argument regarding highly alkaline leachate resulting from contact between slag and water must be assessed in the context of the physical and chemical nature of ferrous slags: Ferrous slags are not mixtures of individual chemicals, but solid materials composed of interlocking mineral phases, comparable to natural igneous rocks. Oxides and metals are chemically bound within crystalline structures rather than present as isolated or reactive compounds. Minor and trace elements (< 5 wt% and < 1 wt%) occur only as substitutions within mineral lattices and do not form separate phases. Metal release cannot be inferred solely from total elemental contents. Their environmental behaviour is governed by mineral stability and geochemical boundary conditions rather than by simple dissolution processes. It depends on geochemical parameters such as mineral solubility, pH conditions, grain size and the L/S. The potential formation of alkaline leachate therefore represents a site-specific process rather than evidence of a systemic material hazard.

Additionally, the argument concerning the leaching of metals from slag to soil and groundwater does not appear to be based on scientifically proven release behaviour. Concentrations measured in leaching tests are L/S-dependent and must be interpreted against a defined, field-relevant L/S basis. As mentioned in Chapter 4.1.c), the German scientific approach underlying the EBV [16] applies such a defined exposure basis to derive protective eluate values and installation conditions ensuring the protection of soil and groundwater when materials are tested and used in compliance with the EBV. Without such a defined reference basis, assumptions regarding harmful metal release remain speculative. Consequently, the mere possibility of metal mobilisation under certain geochemical conditions does not constitute evidence of an intrinsic hazardous property.

Importantly, the toxicological and ecotoxicological datasets generated by the RFSC so far do not indicate intrinsic hazardous effects attributable to trace elements present in ferrous slags (See Factsheet on Ferrous Slags, chapter 4 [12]). This confirms that trace elements are largely immobilized within stable mineral phases and exhibit limited bioavailability under realistic exposure conditions.

### 4.4 Hazard classification claim

On page 6 of the Dutch justification [6] it is stated:

*"Finally, in 2025 an opinion issued by Bureau REACH of RIVM to the ILT on the hazard classification of LD-slag shows that LD-slag has been incorrectly classified as non-hazardous, because, based*

*on all available data, classification for serious eye damage and local respiratory tract irritation is justified. The advice on hazard classification appears to be complementary to the findings in the incident reports mentioned above."*

It cannot be accepted that the classification is justified, given that no scientifically robust data demonstrating compliance with the classification criteria of Regulation (EC) No 1272/2008 (CLP) have been provided. The classification proposal lacks a significant legal and scientific basis as it relies on reports rather than validated hazard data. The classification according to CLP Regulation, Annex 5-9 and 15, must be based on all available data which requires reliable, proven intrinsic hazardous properties either through in vitro, in vivo, or adequate reliable representative human data obtained from controlled studies. Accordingly, the REACH registration dossier must include the classification (Article 10 REACH) and has to be updated if necessary (Article 22 REACH).

The Dutch proposal for classification originated from a limited number of anecdotal human case reports that lacked scientific documentation and triggered a review of the registration dossier of BOS slags that was not conducted as a formal compliance check under Article 41 REACH — a procedure that lies exclusively within the mandate of ECHA and not the Dutch authorities. In its subsequent self-initiated review by RIVM, they assessed the available in vivo and in vitro irritation studies in the REACH Dossier as unreliable mainly for BOS slags.

Even for BOS slags containing free CaO, and although eluates from slags exposed to water may exhibit elevated pH values (e.g. >11.5), the mere presence of free lime or a high pH value does not on its own, justify classification for serious eye damage or irritation under the CLP Regulation.

According to the CLP Regulation (EC) No. 1272/2008, Annex I, Section 3.3.2.2.4, substances and mixtures with extreme pH values (≤2 or ≥ 11.5) are presumed to cause serious eye/skin damage or irritation. However, this presumption can be overruled if scientifically valid test data demonstrate that the material does not cause skin or eye corrosion/irritation.

As documented in the RFSC Fact Sheet of Ferrous Slags [11], more than 25 GLP-compliant skin and eye irritation/corrosion studies have been performed across ferrous slag types, including testing of eluates with pH values above 11.5. Nine studies have Klimisch reliability score 1. These currently available test results show that slag eluates with pH values above 11.5 do not *per se* cause irritant effects neither on skin nor eye.

Accordingly, even if the REACH dossier for BOS slag may require refinement or additional data generation, the currently available validated data do not justify classification for serious eye damage (Eye Dam. 1) or respiratory irritation (STOT SE 3). Proceeding to classification under these circumstances would not be aligned with the evidentiary requirements of the CLP Regulation.

The RFSC is currently generating additional data to further clarify remaining uncertainties and to update the REACH registration dossier where appropriate. However, regulatory classification must be based on demonstrated intrinsic hazard — not on precautionary assumptions, anecdotal reports or theoretical pH considerations.



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### 4.5 Inclusion of Electric Arc Furnace Slag (EAF) in the restriction

The Dutch justification [6] acknowledges that the incidents triggering the national measure primarily concern LD slag and that data on comparable incidents involving EAF slag in the Netherlands are limited or absent. The extension of the measure to EAF slag is therefore not based on observed adverse effects, but on assumed similarity of properties. Such assumptions cannot replace a material-specific risk assessment.

On page 3 the Dutch justification [6] refers to a report from the United States [18] as support for the inclusion of EAF slags. However, a closer review of that report shows that the information cited does not provide a reliable basis for the conclusions drawn. In particular, the report equates total CaO content with free lime, which is **scientifically incorrect**. EAF carbon steel slags contain no free lime, as scrap-based steelmaking requires significantly less lime; added lime is largely consumed and incorporated into stable mineral phases (see explanation in Factsheet on Ferrous Slags, chapter 3 [12]).

Furthermore, the report addresses a broad range of materials, including slags from stainless steel production and secondary metallurgical processes. However, these materials are not clearly differentiated in the assessment, and their characteristics are not consistently evaluated separately from those of EAF carbon steel slags.

Importantly, RFSC has conducted reliable GLP-compliant skin and eye irritation studies on EAF carbon steel (EAF C) slag. Two skin irritation tests (in vivo OECD 404 and in vitro OECD 431) and two eye irritation tests (in vitro HET-CAM and in vivo OECD 405) were performed using solid, finely ground EAF C slag. No irritation or corrosive effects were observed in any of the studies (see Factsheet on Ferrous Slags, Table 2 [12]).

The Dutch justification [6] nonetheless concludes on page 4 that similar risks "may" arise for EAF slag and that this constitutes "reasonable grounds" for concern. However, **speculative assumptions** and **misinterpretations** of analytical data cannot substitute for evidence of a substantiated risk considering that EAF is currently neither produced in Netherlands nor used as extensive as LD slags.

**Extending the restriction measure to materials for which no evidence exists risks undermining both the proportionality and the evidence-based approach required under Article 129 REACH.**

## 5. Legal framework for the assessment under Article 129 REACH

### 5.1 Revocation of provisional restriction in NL required

The imposed provisional restriction in NL cannot be authorised by the Commission but shall be revoked according to Article 129 (2) REACH because it does not fulfil the requirements of Article 129 (1) REACH. The provisional measure can also not be justified by the precautionary principle.

More precisely:

- According to Article 129 (1) REACH a provisional measure is only admissible when there are "justifiable grounds for believing that urgent action is essential to protect human health or the environment in respect of a substance …". Hence, there must be substantial evidence for an existing threat for human health which is so urgent and significant that immediate action is required. **These requirements are not met in the case of the Dutch provisional restriction. The findings on possible health risks to which the Dutch government refers are not substantive and certainly not scientifically proven.**

- Any new information provided in the meantime by the NL-competent authority cannot change this. Such information would now come more than six months after the notification of the provisional measure to the EU Commission in accordance with Article 129 (1) sentence 2 REACH. It is therefore too late to take new information into account. Article 129 (1) sentence 2 REACH requires that the scientific or technical information on which the provisional measure is based must be submitted together with the notification to the Commission. On the basis of this information, submitted at the same time, the EU Commission must decide within 60 days in accordance with Article 129 (2) REACH. If it is not possible to make this timely decision due to insufficient information provided, the provisional measure must be rejected. Only in this way can the requirement for a quick decision on a provisional measure contained in Article 129 (1) and (2) REACH be met.

- This deficiency cannot be overcome for precautionary reasons either. The requirements of Article 129 (1) REACH require evidence of an existing health hazard. The suspicion of a health risk is not sufficient. Only if this were the case would action be justified on the basis of the precautionary principle. Irrespective of this, the application of the precautionary principle in EU law requires "a structured decision-making process with detailed scientific and other objective information" according to the provisions of the "Communication from the Commission on the precautionary principle" of 2 February 2000 (COM2000 1 - final). Furthermore, according to the said Communication (Summary, point 4 on page 2) "The implementation of an approach based on the precautionary principle should start with a scientific evaluation, as complete as possible, and where possible, identifying at each stage the degree of scientific uncertainty." It is not apparent that the Dutch government complied with this requirement when adopting its provisional measure.

- Last but not least, the provisional measure must also be suitable and appropriate. Given the reasons set out in the previous Joint Statement of EUROSLAG, EUROFER, and RFSC [1] as well in this Assessment, this is not the case. Furthermore, within this framework the socio-economic impact, including economic implications on EU-steel industry have to be taken into account (See chapter 2).

It is important to consider that the EU-wide consequences of the Dutch restriction cannot be disregarded on the grounds that this is "only" a provisional national measure. On the one hand, according to Article 129 (3) REACH, if the provisional measure is approved by the Commission, the Dutch government has a duty to initiate a community restrictions procedure for a restriction. Our understanding of Article 129(3) REACH is that, as a general rule, a corresponding restriction



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should be proposed. It cannot be assumed that a dossier for a different restriction will be developed and submitted. Due to this necessary legal consequence of a following procedure for an EU-wide restriction, its possible socio-economic consequences in the entire EU must already be taken into account. On the other hand, the national measure, with the "prospect" of becoming an EU-wide restriction, is already causing considerable irritation and uncertainty throughout the European slag market and thus also the steel market. This can lead to serious and lasting EU-wide socio-economic consequences simply because of maintaining the national measure and of the ongoing restriction procedure. All this must be thoroughly considered by the Commission when deciding whether to approve or reject the national measure. Otherwise, there would be a manifest error of assessment.

### 5.2 Classification paramount to restriction

If the Commission were to approve the Dutch provisional measure, this would inevitably trigger a regular Union restriction procedure under Title VIII of the REACH Regulation. Therefore, the system of regulatory risk management measures under REACH as well as under the CLP Regulation must be taken into account when deciding on a provisional measure under Article 129 REACH.

Hazard classification (CLP) and use restrictions (Title VIII REACH) however, are distinct legal instruments serving different functions. A restriction under Article 68 (1) REACH requires clear evidence of an unacceptable risk arising under realistic conditions of use that needs to be addressed at Union level. Furthermore, pursuant to Article 69 (1) and (3) REACH, a restriction is only justified where the risk is not adequately controlled by existing measures. Hence, it must be demonstrated that implemented risk management measures — including those identified in registrations under Articles 10 to 14 REACH — are insufficient (Annex XV, Section II.3 REACH).

This assessment under Article 129 REACH cannot be properly carried out if the hazard classification is unclear. Should a revised classification be considered necessary in future, the registrant would first be required to update the registration dossier pursuant to Articles 10 and 22 REACH and to reassess and, where appropriate, adapt the risk management measures under Articles 10 to 14 REACH. Only after this regulatory step could it be evaluated whether an unacceptable risk remains that would justify a restriction.

## 6. Regulatory shortcoming in Netherlands

In the documents provided by the Netherlands, their national regulatory shortcomings such as lack of material specific limit values or specific use conditions are explicitly acknowledged [19]. However, the shortcomings have not been improved to see whether the stronger regulatory requirements in Netherlands are sufficient or not to mitigate environmental risks. From this perspective, suggesting a restriction which potentially leads to an EU-wide restriction is not justified.

Across Europe, the use of ferrous slags is regulated under national building and environmental legislation, based on application-specific requirements and environmental compatibility assessments. While regulatory instruments differ between Member States, a common principle applies: **environmental safety is assessed primarily through leaching behaviour under realistic conditions of use**. Established regulatory frameworks in several Member States define clear quality requirements, compliance testing and limit values that ensure the safe and environmentally sound use of ferrous slags.

Limit values for eluates are scientifically derived to ensure the safe and environmentally sound use of these materials.

- In Germany, the "Ersatzbaustoffverordnung" (Substitute Building Materials Act) [15] sets binding, material-specific eluate limit values and defined installation classes based on extensive research and modelling under realistic conditions. This legislation and its limit values have been developed based on results of 44 independent research and developments projects on environmental behaviour of different substitute building materials including ferrous slags. Use of materials covered by the EBV is only permitted where the material-specific eluate limit values for the intended installation class are complied with. Compliance with these binding limit values ensures the protection of soil and groundwater, confirming that quality-controlled slags pose no environmental risk.

- In France, the guidance drafted by SETRA under supervision of the French Ministry, for environmental acceptance of the use of ferrous slags in road works [20] set also procedure, compliance testing and limit values based on different [21] condition of use. Geochemical modelling approach was used to define these thresholds, ensuring safe uses of slags since many years.

- In Finland, under the environmental permit of the SSAB Raahe steelworks, LD slag is classified as a by-product. Accordingly, it is placed on the market under normal product responsibility. In practice, LD slag is supplied to the road construction sector as a blended product consisting of LD slag and granulated blast furnace slag (GBS). Its use has been demonstrated to be environmentally safe, supported inter alia by the substance's REACH registration [22].



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## References


[1] EUROSLAG, EUROFER, REACH-Ferrous Slag Consortium (2025): Joint statement against restrictions imposed by the Dutch government on use of Ferrous Slags – Requirements for provisional measures not fulfilled - October 7th, 2025.

[2] www.euroslag.com

[3] www.worldsteel.org

[4] EUROFER – Steel in Figures 2025

[5] Personal communication with Tata Steel Europe.

[6] Annex – Clarification of the justification for the different parts of the Dutch restriction on steel slags, submitted to the Eu Commission, February 2026)

[7] ILT, Onderzoek grootschalige toepassingen LD-staalslakken, 2025 (conceptversie, intern vertrouwelijk)

[8] De Vuilnisman, 21 March 2021, https://tvblik.nl/de-vuilnisman/21-maart-2021

[9] RIVM, Milieuhygiënische kwaliteit LD-staalslakken, Literatuurstudie, 2023, kenmerk RIVM-rapport 2022-0180 https://open.overheid.nl/documenten/ronl-7bb51dd218c6f5fa3bf3e06eb3392910894e0b89/pdf

[10] de Volkskrant, 26 September 2023, page 13 and 14, https://www.volkskrant.nl/kijkverder/v/2023/de-giftige-staalslakken-van-eerbeek~v924094/

[11] AfvalOnline, 15 May 2025, https://afvalonline.nl/nieuws/43342/weinig-fysieke-gezondheidsrisicos-door-staalslakken-eerbeek

[12] EUROSLAG, EUROFER, REACH-Ferrous Slag-Consortium (2026): Fact sheet on Ferrous slag, March 2026

[13] German a., Winnefeld F., Lura p. Rentsch D., Lothenbach B. (2023) Hydrous carbonate-containing brucite (HCB) in MgO/hydromagnesite blends. Cement and concrete Research 173

[14] Susset, B.; Grathwohl, P.; Finkel, M.; Oest, J.; Betz, A.: Evaluierung der Bewertungsverfahren im Kontext mit der Verwertung mineralischer Abfälle in/auf Böden, Teil I: Stofffreisetzungsverhalten mineralischer Abfälle. In: UBA-Texte, UBA Text 112/2017, Dessau, 2017, https://www.umweltbundesamt.de/publikationen/evaluierung-der-bewertungsverfahren-im-kontext-der

[15] Susset, B.; Leuchs, W.: Ableitung von Materialwerten im Eluat und Einbaumöglichkeiten mineralischer Ersatzbaustoffe - Umsetzung der Ergebnisse des BMBF-Verbundes „Sickerwasserprognose“ in konkrete Vorschläge zur Harmonisierung von Methoden, UBA Texte 04/2011, Dessau-Roßlau (02/2011) S. 124

[16] Verordnung über Anforderungen an den Einbau von mineralischen Ersatzbaustoffen in technische Bauwerke vom 9. Juli 2021 (BGBl. I S. 2598), die durch Artikel 1 der Verordnung vom 13. Juli 2023 (BGBl. 2023 I Nr. 186) geändert worden ist.




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[17] Tauw, Onderzoek naar toepassing van Duomix, Bureauonderzoek naar toepassing van Duomix in Nederland en beoordeling van risico's aan de toepassingen, 11 februari 2025, kenmerk R001-1297813MLX-V01-aao-NL, https://iplo.nl/publish/pages/239634/eindrapport-onderzoek-naar-toepassing-duomix-11-februari-2025.pd

[18] National Academy of Sciences, The National Academies Press, Health Risk Consideration for the Use of Unencapsulated Steel Slag, 2023

[19] RIVM, Evaluatie normeringskader (her)gebruik secundaire bouwstoffen, juni 2024, kenmerk RIVM-rapport 2024-0074 Evaluatie normeringskader (her)gebruik secundaire bouwstoffen, https://www.rivm.nl/bibliotheek/rapporten/2024-0074.pdf

[20] Acceptabilité environnementale des matériaux alternatifs en technique routières – Les laitiers sidérurgiques, SETRA – Octobre 2012 / Environnemental acceptance of secondary source materials in road works – Ferrous slags, SETRA – October 2012

[21] IDRRIM : Guide des Terrassements des Remblais et des couches de forme (Fascicules 1 et 2) – 2024 (Editions CEREMA) / French Institute for Road Infrastructures : earthworks technical guidelines for embankments and road base layer (Parts 1 and 2) – 2024

[22] Personal Communication with SSAB Raahe.

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