Occupational exposure to aluminium and its poorly soluble compounds

Purpose To alert companies throughout the value chain to proposed German occupational exposure limits, explain their possible implications, and invite early cooperation in an industry socio-economic analysis.

Executive Summary

The German MAK Commission has completed a scientific re-evaluation of aluminium and its poorly soluble compounds and proposed substantially lower occupational exposure limits: **0.05 mg Al/m^3 for the respirable fraction** and **0.5 mg Al/m^3 for the inhalable fraction**. The recommendations are now being considered in the German regulatory process and are not yet binding legal limits.

Protecting workers' health and safety is an industry priority. Safe handling, effective exposure control and reliable workplace measurements remain essential irrespective of the regulatory outcome. At the same time, the proposed values raise scientific, measurement, technical, practical and socio-economic questions that require evidence from manufacturers and downstream users.

EPSA and cooperating stakeholders intend to commission an external consultant to conduct a socio-economic analysis (SEA). The work will examine exposure situations, technical feasibility, compliance measures and potential effects on operations and supply chains. The indicative overall cost is approximately EUR 100,000, to be shared among participating companies.

This common communication is intended for circulation by EPSA members to customers and by relevant downstream associations to their members. Companies should assess whether they may be affected, share the communication through their value chain and consider participating in the SEA.

1. Regulatory context

Background and scope

Aluminium and aluminium compounds are used across many industrial sectors, including chemicals, catalysts, specialty aluminas, coatings, pigments, ceramics, refractories, construction materials, batteries and other manufactured products. The present discussion concerns occupational exposure, particularly the inhalation of airborne aluminium-containing dust during manufacturing, handling, processing and downstream use.

In July 2024, the German MAK Commission published a comprehensive re-evaluation of aluminium and its poorly soluble compounds. Poorly soluble compounds are aluminium-containing materials that dissolve only very slowly in biological fluids. The discussion includes:

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- aluminum [CAS: 7429-90-5],
- aluminum hydroxide [21645-51-2],
- aluminum oxide [1344-28-1] γ-modification and δ-modification (insoluble α-aluminium oxide/ corundum is excluded), and
- aluminum oxyhydroxide [1318-23-6; 24623-77-6] γ-modification.

MAK review and proposed occupational exposure limits

The MAK Commission is an independent scientific body established by the German Research Foundation (DFG). It reviews scientific evidence and recommends health-based workplace exposure limits for subsequent consideration by regulatory authorities. Its review covered published literature, occupational exposure studies, animal inhalation studies, toxicological information on respiratory and neurological effects, and additional unpublished studies submitted for evaluation. The Commission considered respiratory effects in the lung to be the most sensitive endpoint for setting exposure limits for poorly soluble aluminium compounds.

Airborne fraction	Proposed value
Respirable fraction	0.05 mg Al/m^3
Inhalable fraction	0.5 mg Al/m^3

Occupational exposure limits represent concentrations in workplace air intended to protect workers' health over a working lifetime. The respirable fraction consists of very small particles that can reach deep into the lungs; the inhalable fraction includes particles that can enter the nose and mouth during normal work. The proposed values are significantly lower than the currently applied TRGS 900 general dust limits of 1.25 mg/m^3 for the respirable fraction and 10 mg/m^3 for the inhalable fraction - which apply to the total mass of dust rather than specifically to its aluminium content.

Next regulatory steps in Germany

The MAK recommendations are scientific proposals and do not automatically become binding legal requirements. The German Committee on Hazardous Substances (AGS) is currently assessing whether and how they should be translated into regulatory occupational exposure limits. In doing so, the AGS may consider the scientific basis, measurement capability, technical feasibility, practical implementation and additional stakeholder information.

TRGS are Technical Rules for Hazardous Substances that explain how companies can comply with German occupational safety requirements. The Hazardous Substances Ordinance (GefStoffV) is Germany's principal legal framework for protecting workers from hazardous substances. If adopted, the proposed values would likely be incorporated into TRGS 900 and become binding as part of the wider German occupational safety system.

Although the process is taking place in Germany, developments of this kind may attract attention from regulators, authorities and stakeholders elsewhere in Europe. Companies therefore consider the discussion potentially relevant at European level and are monitoring it closely.

2. Relevance for industry

No final regulatory decision has been taken. If the proposed values are adopted, companies across the value chain may need to determine whether existing operations can consistently achieve and demonstrate compliance. The implications will vary according to the material, process, dustiness, task, workplace and measurement method. Compliance may be straightforward for some operations but more challenging for others.

Areas that may require review

- workplace exposure monitoring and the suitability of sampling and analytical methods at low concentrations;
- enclosure, local exhaust ventilation, dust collection and other engineering controls;
- process design, housekeeping, maintenance and operating practices;
- personal protective equipment, worker information, training and risk-management procedures;
- additional measurements, process modifications, capital investment, operating costs and possible production constraints;
- availability of alternatives and potential effects on products, customers and downstream supply chains.

The full economic impact is not yet known and will depend on the final regulatory outcome and implementation requirements. Impacts could nevertheless be significant for some sectors, especially where suitable alternatives are limited or substantial technical adaptation is required. Decisions should therefore be informed by scientific evidence together with a realistic understanding of measurement capability, technical feasibility and implementation in actual workplaces.

Worker safety remains central. Industry engagement is not intended to weaken protection. Its purpose is to ensure that measures are based on sound science, can be measured and implemented reliably, and improve worker protection in real workplaces.

3. Industry activity

Companies, sector associations and expert groups are cooperating to support evidence-based decision-making. Current work includes reviewing the scientific basis of the MAK proposal, collecting workplace exposure and production-and-use information, developing additional scientific evidence, assessing the behaviour and biosolubility of relevant compounds, and preparing a socio-economic analysis.

Why value-chain evidence is needed

Relevant information is distributed across the value chain. Producers understand substance properties and manufacturing conditions, while formulators, processors and users hold essential information on applications, handling, exposure scenarios, technical controls and substitution constraints. Without this evidence, regulators and industry may not understand where compliance is readily achievable, where significant adaptation may be required, or where wider impacts could arise. Early cooperation can support proportionate measures, avoid unnecessary disruption and maintain strong worker protection.

Information that may be requested

- uses, applications, production or use patterns, and volumes relevant to the affected materials;
- workplace tasks and exposure situations, preferably supported by measurement data;
- existing control measures and evidence of their performance;
- technical feasibility, investment needs, operating costs and implementation lead times;
- potential effects on production, product availability, customers and strategic value chains.

Planned socio-economic analysis

EPSA intends to commission an external consultant to consolidate information provided under appropriate confidentiality arrangements, assess potential compliance scenarios and describe possible impacts across the value chain. The scope and methodology will be confirmed with the selected consultant and participating companies.

The indicative overall cost is approximately EUR 100,000 and will be shared among all participating companies. Each company's contribution will depend on the final number of participants and will decrease

as more companies join. Allocation, governance, confidentiality arrangements and deliverables will be agreed before the project starts.

Companies may participate by supporting the work financially and, where possible, providing technical, exposure, use or economic data. Active data contribution will strengthen the analysis. The feasibility of company-specific feedback or analysis will be discussed with the consultant and cannot yet be guaranteed.

4. Requested action

Companies that manufacture, formulate, process, distribute or use aluminium and relevant poorly soluble aluminium compounds are invited to:

- review whether their operations, products, customers or supply chains may be affected;
- share this communication with the appropriate occupational safety, technical, regulatory, operations and business colleagues;
- contact the relevant industry association and encourage coordinated sector input;
- identify technical, exposure, use and socio-economic data that could be made available under suitable confidentiality arrangements;
- if they wish to access or participate in the SEA, complete the accompanying Letter of Intent and return it to EPSA, preferably by the end of November 2026.

Distribution through the value chain

EPSA members are invited to send this common communication, the Letter of Intent and a short company cover note to relevant customers. Customers are encouraged to refer the issue to their own industry associations. EPSA will also approach relevant downstream associations and invite them to circulate the same materials to their members. Receipt through more than one channel is acceptable and may help reinforce awareness.

This coordinated approach is intended to raise awareness, connect affected companies with the ongoing work and ensure that future decisions draw on the best available scientific, technical and socio-economic information.

5. Key references

- MAK justification: Aluminium and its poorly soluble compounds
- DFG MAK Commission: mandate and published results
- DGUV: occupational exposure limits and the AGS process
- BAuA: TRGS 900 Occupational Exposure Limits

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EPSA is a Cefic Sector Group, representing the leading producers of specialty alumina in Europe. For more information: https://specialty-chemicals.eu/epsa/

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