

BARIUM SULFATE

CAS number: 7727-43-7

Synonyms: Barium sulphate, blanc fixe

Chemical formula: BaSO₄

Workplace exposure standard (amended)

TWA: 1.35 mg/m³ (respirable)
4 mg/m³ (inhalable)

STEL: —

Peak limitation: —

Notations: —

IDLH: —

Sampling and analysis: The recommended value is readily quantifiable through currently available sampling and analysis techniques.

Recommendation and basis for workplace exposure standard

A TWA of 1.35 mg/m³ (respirable fraction) and 4 mg/m³ (inhalable fraction) are recommended to protect for pneumoconiosis (baritosis) in exposed workers.

Discussion and conclusions

Barium sulfate is used for oil well drilling and is sourced from the mineral barite. The accumulation of particulate barium sulfate in the lungs is reported to result in a benign, non-collagenous pneumoconiosis called baritosis. Although limited information exists on reliable airborne concentration levels, one study suggested exposure to an estimated 3.5 mg/m³ (considered to be respirable) is associated with baritosis. A decline in observed health effects and the amount of barium sulfate retained in the lungs is reported following removal from exposure (ACGIH, 2018; DFG, 2017; US EPA, 2005).

There are insufficient dose-response data and substance-specific toxicity evidence. On a weight of evidence basis, there is negligible difference to separate barium sulphate dust (respirable or inhalable) from other nuisance dusts. Therefore, the TWA for the respirable fraction is adopted directly from DFG (2017) who derived their MAK for respirable fraction of particulate matter from the general threshold limit value for dusts. The DFG (2017) MAK for the inhalable fraction is also recommended because it is considered protective for effects attributed to inhalable dusts.

Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling on Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

Insufficient evidence to recommend a skin notation.

APPENDIX

Primary sources with reports

Source	Year set	Standard
SWA	1991	TWA: 10 mg/m³
ACGIH	2014	TLV-TWA: 5 mg/m³ (Inhalable particulate matter containing no asbestos and < 1% crystalline silica)
TLV-TWA recommended to protect for inflammation of the lung or pneumoconiosis.		
Summary of data:		
Human data:		
<ul style="list-style-type: none"> Accumulation of dust in lungs reported to cause benign, non-collagenous pneumoconiosis or baritosis In a study (1976), 9/12 workers exposed to an estimated 3.5 mg/m³ presented with baritosis (duration not reported); follow-up 9 yr post exposure indicated decline in extent of radiologic opacities Another study identified 4 male baryte miners with pneumoconiosis, 3 that developed PMF; silicosis was diagnosed in 2/3 PMF cases, suggesting Ba ores may have crystalline silica contamination Case reports of accidental inhalation (contrast medium) during radiographic studies of the GIT resulted in fever, dyspnoea, hypoxemia, mild fibrosis, and death. 		
Animal data:		
<ul style="list-style-type: none"> Increase neutrophils and macrophages, focal fibrosis, granulomas and emphysema noted in instillation of rats and dogs with a BaSO₄ contrast medium solution (containing another contrast solution) Rats exposed to 40 mg/m³ for 2 mo developed time-dependent lung responses (epithelial cell effects in conducting airways and alveolar region, and bronchiolar lining changes) NOAEL: 37.5 mg/m³ (respirable dimensions) for neutrophil influx and macrophage accumulation (rats; 119 d). 		
DFG	2017	MAK: 1.35 mg/m³ (respirable); 4 mg/m³ (inhalable)
MAK recommended to protect for adverse health effects associated with the general particle effect of bio-persistent granular dusts.		
Summary of additional data:		
<ul style="list-style-type: none"> Described as poorly soluble and when inhaled, producing effects in the lungs via same mechanisms as bio-persistent granular dusts Suitable data in human and animal studies are not available MAK derived by multiplication of general threshold limit value for dust (0.3 mg/m³) by the material density of BaSO₄ 4.5 g/cm³ Historic MAK for inhalable fraction of 4 mg/m³ was retained due to a lack of any new data since last assessment. 		
SCOEL	NA	NA
No report		

Source	Year set	Standard
OARS/AIHA	NA	NA
No report		
HCOTN	NA	NA
No report		

Secondary source reports relied upon

Source	Year	Additional information
NICNAS	✓ 2019	• No additional information.
US EPA	✓ 2005	<ul style="list-style-type: none"> • Exposure results in baritosis identified by many opacities observed on radiographs; no alterations in lung function or increase incidence of subjective symptoms • No exposure concentrations resulting in baritosis identified • Accumulation in the lungs reduces upon removal from exposure.

Carcinogenicity — non-threshold based genotoxic carcinogens

Is the chemical mutagenic?

No

The chemical is not a non-threshold based genotoxic carcinogen.

Notations

Source	Notations
SWA	—
HCIS	NA
NICNAS	NA
EU Annex	NA
ECHA	NA
ACGIH	—
DFG	Carcinogenicity – 4
SCOEL	NA
HCOTN	NA
IARC	NA
US NIOSH	NA

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

Skin notation assessment

Calculation

Insufficient data available to assign a skin notation.

IDLH

Is there a suitable IDLH value available? No

Additional information

Molecular weight:	233.38
Conversion factors at 25°C and 101.3 kPa:	1 ppm = Number mg/m ³ ; 1 mg/m ³ = Number ppm
This chemical is used as a pesticide:	<input type="checkbox"/>
This chemical is a biological product:	<input type="checkbox"/>
This chemical is a by-product of a process:	<input type="checkbox"/>
A biological exposure index has been recommended by these agencies:	<input type="checkbox"/> ACGIH <input type="checkbox"/> DFG <input type="checkbox"/> SCOEL

Workplace exposure standard history

Year	Standard
Click here to enter year	

References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [TLVs® and BEIs® Guidelines section](#) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2017) Barium sulfate / (barium(2+);sulfate) – MAK value documentation.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (Accessed 2019) Sulfuric acid, barium salt (1:1): Human health tier I assessment – IMAP report

US Environmental Protection Agency (US EPA) (2005) Barium and Compounds. Integrated Risk Information System (IRIS) Chemical Assessment Summary