# Graphite (all forms except fibres) (respirable dust) (natural & synthetic)

| CAS number: | 7782-42-5 |
| --- | --- |
| Synonyms: | Black lead, mineral carbon, plumbago |
| Chemical formula: | C |
| Structural formula: | — |

Workplace exposure standard (retained)

| TWA: | **3 mg/m3** |
| --- | --- |
| STEL: | — |
| Peak limitation: | — |
| Notations: | — |
| IDLH: | **1,250 mg/m3** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 3 mg/m3 is recommended to protect for graphite pneumoconiosis in exposed workers.

## Discussion and conclusions

Graphite is used in the manufacture of crucibles for melting nonferrous metals, for foundry facings, for re-carburising steel, in various lubricants, as electrodes, as filters in dry cells, as an art medium and in carbon brushes for electrical motors and other electrical equipment.

The critical effect of exposure is graphite pneumoconiosis, of which the pathology is similar to coal workers' pneumoconiosis with the disease severity increasing with crystalline silica content.

Depending on the source, silica content will vary (ACGIH, 2018). A high prevalence of pneumoconiosis is identified in graphite electrode production workers exposed at an average of 58 mg/m3 (silica <0.1%). Pneumoconiosis is reported in synthetic graphite electrodes production workers exposed at 65.5 mg/m3, with the frequency of changes in the lungs identified as proportional to the duration of exposure (ACGIH, 2018; DFG, 2014). Animal studies indicate a weak fibrogenic potential for pure graphite dust, as can also be found with poorly soluble dusts. Exposure to mixed dust from graphite and quartz resulted in significantly stronger fibrotic reactions in the lungs of laboratory animals compared to pure graphite dust (DFG, 2014).

With the absence of contradictory evidence, a TWA of 3 mg/m3 is recommended to be retained and is expected to be protective of pneumoconiosis in exposed workers.

## Recommendation for notations

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

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

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 3 mg/m3 | |
| * Established based on the ACGIH TLV-TWA for graphite (all forms) at 2 mg/m3 respirable dust; while the current exposure standard for coal dust in Australia in Australia is 3 mg/m3 * This exposure standard is based on the established link between graphite and coal dust, with due consideration for the exposure standard for coal dust in Australia, and should be low enough to control pneumoconiosis in graphite workers result of different sampling strategies and respirable dust criteria; no further information. |
| ACGIH 2001 TLV-TWA: 2 mg/m3 (respirable fraction) |
| TLV-TWA recommended to minimise the potential for graphite pneumoconiosis.  Applies to respirable particulate not graphite fibres.  Summary of data:  Human data:   * Pathology of graphite pneumoconiosis like coal workers' pneumoconiosis; disease severity increases with crystalline silica content due to increasing the fibrogenic activity: * natural and synthetic the same outcome * 112/256 employees of a carbon electrode manufacturing plant had graphite pneumoconiosis: * average total dust 57.6 mg/m3 (14.5–138.8 mg/m3) * settled dust samples 99.6% pure carbon <0.1% crystalline silica * Pneumoconiosis reported in synthetic graphite electrodes production workers exposed at 65.5 mg/m3: * frequency of changes in the lungs proportional to the duration of exposure; no further information.   Animal data:   * Rats given graphite ‘of low ash content’ by intratracheal injection produced mild fibrotic reactions.   TWA-TLV based on above information and similarity of graphite pneumoconiosis to coal workers' pneumoconiosis.  No specific derivation or point of departure is presented.  Insufficient data to recommend skin, sensitiser or carcinogenicity notations or STEL. |
| DFG 2014 MAK: 4 mg/m3 (inhalable); 1.5 mg/m3 (respirable) |
| Recommended MAK values are adopted from those for general dust  Summary of additional data   * Concludes that the evidence in humans from repeated exposure are insufficient to derive a MAK due to inadequate descriptions of the exposure level, duration, dust composition and analysis * Summary of animal studies indicate weak fibrogenic potential for pure graphite dust, as can also be found with poorly soluble dusts * Exposure to mixed dust from graphite and quartz resulted in significantly stronger fibrotic reactions in the lungs of laboratory animals compared to pure graphite dust. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

NIL.

### 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 | — |
| 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 to assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 12.01 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number ppm |
| This chemical is used as a pesticide: |  |
| This chemical is a biological product: |  |
| This chemical is a by-product of a process: |  |
| A biological exposure index has been recommended by these agencies: | ACGIH  DFG  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*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2014) Graphite (respirable fraction) – MAK value documentation.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Graphite (natural).