# COAL DUST (CONTAINING < 5 % QUARTZ) (RESPIRABLE DUST)

| CAS number: | ̶ |
| --- | --- |
| Synonyms: | Anthracite coal dust, bituminous coal dust, lignite coal dust, coal mine dust |
| Chemical formula: | n/a – complex mixture |

Workplace exposure standard (amended)

| TWA: | **0.9 mg/m3 (respirable dust) bituminous and lignite coal;  0.4 mg/m3 (respirable dust) anthracite coal** |
| --- | --- |
| STEL: | **­—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **—** |

**Sampling and analysis**: as per AS2985:2009 *Workplace atmospheres – Method for sampling and gravimetric determination of respirable dust*; for sampling periods greater than 60 minutes:

* 0.01 mg/m3 (six-place microbalances), and
* 0.1 mg/m3 (five-place semi-microbalances).

## Recommendation and basis for workplace exposure standard

A TWA of 0.9 mg/m3 for respirable dusts of bituminous and lignite coal and 0.4 mg/m3 for respirable dusts of anthracite coal are recommended to prevent coal worker’s pneumoconiosis (CWP), progressive massive fibrosis (PMF) and chronic obstructive pulmonary disease (COPD). The recommended TWA’s are also protective of significant lung function decrements reported at concentrations of 2 mg/m3.

Multiple data sources note that limitations in epidemiological studies suggest that adverse health effects (CWP and PMF) may be observed at the recommended TWA and it is recommended that exposure be controlled to as low as reasonably practicable.

## Discussion and conclusions

Coal dust is a complex mixture based on the source geological strata and may contain other hazardous substances including crystalline silica. Coal is ranked on carbon content:

* anthracite coal (hard coal) contains 91 to 95 per cent carbon
* bituminous coal (soft coal) contains 76 to 90 per cent carbon, and
* lignite coal (brown coal) contains 65 to 70 per cent carbon.

Occupational epidemiological studies have reported increases in CWP risk estimates and PMF prevalence predictions associated with increasing carbon content. Therefore, two TWA values are recommended depending on the type of coal exposure in workers. It is unclear if anthracite coal is currently mined or processed in Australia. Therefore, it is recommended that an evaluation of coal rank in Australia is undertaken at the next scheduled review to determine whether a WES is needed for anthracite coal.

Animal studies suggest the effects of coal dust are independent from those of quartz at up to seven per cent quartz content. While the WES sets a percentage quartz level for the TWA for coal dust, further evaluation is recommended at the next scheduled review to determine if there is evidence to support or amend this percentage level.

## Recommendation for notations

A carcinogenicity notation is not assigned as there is inadequate evidence in humans and experimental animals for the carcinogenicity of coal dust. While evidence of lung cancer and stomach cancer in mine workers has been reported, data were inadequate and inconsistent in reaching conclusions on an association with coal dust exposures. A review of the literature is recommended to establish a classification for carcinogenicity according to the GHS.

Insufficient data were available to assign skin or sensitiser notations.

# Appendix

## Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1990 TWA: 3 mg/m³ (respirable dust containing < 5 % quartz) | |
| NOHSC Exposure Standards Working Group recommended a TWA of 3 mg/m3 for coal dust containing less than 5 % quartz (respirable dust).  This recommendation was based on historical use in Australia with recommendations that atmospheric levels be kept low enough to control pneumoconiosis in coal mines. |
| ACGIH 2001 TLV-TWA: 0.9 mg/m³ bituminous coal or lignite coal  0.4 mg/m³ anthracite coal (respirable fraction) |
| Summary of recommendation:   * The limits are intended to minimize the potential of developing PMF and COPD over a 40‑yr working life. TLV-TWA for miners exposed to respirable coal particulate should also be protective for non-mining workers. * TLV–TWA of 0.9 mg/m3 is recommended for exposures to bituminous or lignite coal dust, and TLV–TWA of 0.4 mg/m3 is recommended for exposures to anthracite coal dust. * It is noted that exposure levels should be controlled as low as achievable because a small risk of developing PMF may exist below the TLV-TWA values recommended. * Epidemiology studies demonstrate that the prevalence of CWP and PMF (category 1 and above) are dependent on the rank of the coal dust. * PMF prevalence predictions indicate that there is a risk of developing category 1 or greater CWP at 1 mg/m3. It is also noted that there is only a minimal reduction in PMF prevalence when mean dust levels are halved from 1 to 0.5 mg/m3 regardless of coal rank. There is uncertainty with the prevalence predictions as they are based upon exposure estimates in epidemiology studies. * At 2 mg/m3 there is a risk of reduced lung function, noting that a significant lung function decrement is considered to be > 20 % and excess prevalence at 1 mg/m3 is estimated to be < 5 %. * Mortality studies reported statistically significant excess risk of stomach cancer; with one study reporting an association between stomach cancer and coal mine dust exposure. Confounding factors (including diet, cigarette smoking and chewing tobacco) and their relationship with coal dust exposure and stomach cancer development were not examined in these studies. This resulted in an A4 notation (not classifiable as a human carcinogen). * The report notes that coal dust often also contains crystalline silica and both dusts should be sampled and measured against their individual TLV-TWA. * There is insufficient data to assign sensitiser or skin notations. |
| DFG 2002 Not assigned |
| A MAK value is not assigned due to carcinogenicity effects.  Summary of discussion:   * Coal dust results in chronic bronchitis, pulmonary emphysema and CWP in humans. Due to the quartz content in coal dust, silicosis can also develop. * CWP is considered the critical effect in humans. There is a higher risk of developing radiographically diagnosed CWP with higher ranking coal containing lower levels of quartz. The fibrotic effects of coal dust appear independent of quartz content up to 7 %. * Epidemiology studies reveal a positive association between CWP and either the duration of underground work or cumulative exposure levels to respirable coal dust. These studies also demonstrate that once diagnosed, CWP progresses after the end of exposure. * Epidemiological data indicates an excess risk of lung and stomach cancer; however, inherent study limitations make these difficult to evaluate. Studies demonstrate:   + an inconsistent causal relationship with lung cancer   + a consistent increased risk of stomach cancer with an inconsistent dose-response relationship   + no evidence of increased total cancer risk for coal miners. * Evidence does not support a genotoxic effect in humans. * There are no available data to derive a NOAEL. Assuming a threshold model, epidemiology studies suggest a threshold of 1.5 mg/m3 to protect for CWP noting uncertainty due to the wide scatter of data. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| AIOH |  | 2018 | Recommends exposure to be below TWA 1.0 mg/m3; with 0.5 mg/m3 noted as an action level to investigate exposure and implement control strategies.  Incidence of lung disease (CWP, PMF and COPD) is related to cumulative exposure. Increased aged, coal rank and mineral contaminants influence disease outcomes.  Exposure to other dusts (for example crystalline silica and stone dust) should be assessed in conjunction with RCD exposure where indicated.  There is limited Australian specific quantitative, epidemiology data available.  International studies report adverse health effects below 3 mg/m3 and indicate that there remains a risk of CWP and PMF for long term exposure at 1 mg/m3.  The AIOH evaluated data relating to the prevalence of categories 1+ and 2+ CWP and demonstrated that category 2+ CWP is not found at cumulative exposure of 30 mg/m3 × years (equating to 1 mg/m3 -rounding up - over a working life). The prevalence trend for 1+ CWP was less clear. The evaluation noted data limitations. |
| US NIOSH |  | 1995 | Recommends a TWA of 1 mg/m³ [measured according to MSHA method (CPSU)] equivalent to a TWA of 0.9 mg/m³ [measured according to ISO/CEN/ACGIH criteria].  The TWA is assigned to protect workers from the chronic effects of exposure to respirable coal mine dust (CWP, PMF, silicosis, COPD).  The REL applies to respirable coal mine dust and respirable coal dust in occupations other than mining. NIOSH recommends a separate REL for crystalline silica. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |

Coal dust is not a non-threshold based genotoxic carcinogen.

## Notations

| Source | | Notations |
| --- | --- | --- |
| SWA | — | |
| HCIS | — | |
| NICNAS | — | |
| EU Annex | — | |
| ECHA | — | |
| ACGIH | Carcinogenicity – A4 | |
| DFG | Carcinogenicity – 3B | |
| SCOEL | — | |
| HCOTN | — | |
| IARC | Carcinogenicity – Group 3 | |
| US NIOSH | — | |

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

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| This chemical is a by-product of a process: |  |
| --- | --- |

## 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.

Australian Institute of Occupational Hygienists (AIOH) (2018) Position paper respirable coal dust and its potential for occupational health issues.

Deutsche Forschungsgemeinschaft (DFG) (2002) Coal mine dust [MAK value documentation, 2002].

IARC International Agency for Research on Cancer (IARC) (1997) Silica, Some Silicates, Coal Dust and para-Aramid Fibrils. IARC Monographs on the evaluation of the carcinogenic risk to humans.

Safe Work Australia (SWA) (2018a). Hazardous Chemical Information System.

Safe Work Australia (SWA) (2018b). Workplace exposure standards for airborne contaminants.

US National Institute for Occupational Safety and Health (NIOSH) (1995) Criteria for a recommended standard: Occupational exposure to respirable coal mine dust.