

Review of EPA & NIOSH Crystalline Silica Papers

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Objectives

- Analyze Information in EPA and NIOSH Reports as part of CEWG's ongoing study of Crystalline Silica
- Evaluate the Risk Associated with Crystalline Silica Exposures in the Ambient Air
- Describe the Health Effects of Silica Exposures

Comparison of Crystalline & Amorphous Silica Health Effects

- Both have health effects at low levels
- Crystalline Silica produces more severe consequences
- Crystalline Silica is thought to be a human carcinogen while amorphous is not thought to be

Estimated Risk Levels

- Based on studies of Miners; Crystalline Silica exposures of about 1 milligram per cubic meter mining-year would be about the level at which some silicosis might be expected. One $1\text{mg}/\text{m}^3$ corresponds to a lifetime exposure of $1000\text{ug}/\text{m}^3 \times 5/7 \times 10/20 /70 \text{ years} = 5 \text{ ug}/\text{m}^3$

Differences between Ambient & Mining exposures

- Healthy white males (South Africa)
- Mining tends to have smaller particles with freshly broken surfaces
- Other dust levels are high in mines
- There were only 2,235 miners in the sample

Conclusions on Ambient levels

- Silica contents usually less than 10% of total fine particle concentrations
- Silica particle sizes are relatively large
- General urban areas appear to be protected by ambient standards
- Different assumptions near Intel
- Note that risk assessment used 60 micrograms per cubic meter as safe

NIOSH Conclusions

- Difficult to measure Crystalline Silica concentrations below 50 ug/m^3
- Work place standard of 50 ug/m^3 is not necessarily protective of worker's health – 45 years at 50 ug/m^3 produces 10 to 30% risk of silicosis (corresponds to 11 ug/m^3 for 70 years, 7 days a week and 24 hours per day)

Other Effects

- Enhanced risk of TB
- Enhanced risk of autoimmune disease
- Enhanced risk of chronic bronchitis

What does this say about Intel Environ's?

- Estimates of Fine particles from RTO are approximately $1.5\text{ug}/\text{m}^3$ (note that with comparable emissions Risk Assessment gave about $0.15\text{ug}/\text{m}^3$)
- Background crystalline silica is estimated to be ? x $7.3\text{ ug}/\text{m}^3$
- Total is ? x $7.3 + \text{fraction crystalline} \times 1.5$

Intel Environs (cont.)

- Example calculations: suppose we assume 1% of Intel's silica emissions are crystalline and 10% of the background fine particle is crystalline silica; then total is:
- Crystalline silica concentrations are: $.01 \times 1.5 + .10 \times 7.3 = .745 \text{ug/m}^3$
- Damage levels for miners are 5.1, but for general public should use about 1/10 of this; equals $.51 \text{ug/m}^3$

Intel Environs (cont.)

- Suggests levels of concern, but depends mostly on background crystalline silica levels
- Since the fine particle levels are already estimated to be above the World Health Organizations level of concern of $10\mu\text{g}/\text{m}^3$ the fine particle levels may represent a bigger concern

Some Caveats

- There are two other major studies of miners that give about 60% lower levels of concern (South Dakota miners) or 60% higher levels (Canadian miners)
- Fine particle estimated concentrations used emissions that are somewhat too high
- Modeling always involves some uncertainties