

Crystalline silica in construction: strategies to reduce exposures and to promote sustainable nanotechnologies in the workplace

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Abstract

Crystalline silica, a naturally occurring mineral, is a major component of numerous construction materials including sand, stone, granite, concrete, brick, and mortar. Occupational exposures to respirable crystalline silica (RCS) particles have been associated with silicosis, chronic obstructive pulmonary disease (COPD), and lung cancer [1,2]. In 2016, the US Occupational Safety and Health Administration (OSHA) promulgated a new RCS standard that contains provisions for using engineering controls in the workplace [3]. We present here the results of our field investigations conducted at several Massachusetts construction sites. The objective was to evaluate the efficacy of different engineering controls in reducing airborne exposures to RCS during demolition, crushing, and bridge repair. Personal breathing zone air samples collected among 51 workers were analyzed for RCS content with Fourier Transform Infrared Spectrophotometry (FT-IR) according to the National Institute for Occupational Safety and Health (NIOSH) Method 7602. Results suggest that a combination of wet dust suppression with respirator use is needed to comply with the new OSHA PEL of 50 $\mu\text{g}/\text{m}^3$ in the worst exposure scenarios [4]. Although these traditional exposure reduction measures continue to be important for reducing occupational health risks, the implementation of sustainable nanotechnologies must be promoted when applicable.

References

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Figures



Figure 1: National Institute for Occupational Safety and Health (NIOSH) Hierarchy of Controls