

Using OSHA Method, an aluminum cyclone was loaded with a 25 mm Mixed Cellulose Ester (MCE) filter to sample respirable Mn contaminant. A filter cassette loaded with a 25 mm MCE filter was used to sample total Mn contaminant. The IOM sampler was used to sample inhalable and respirable fractions simultaneously by a foam insert with specific porosity to trap inhalable particles, and respirable size particles are allowed to pass through and be collected on a 25 mm MCE filter. All monitoring was performed by area sampling. A total of 20 side by side samples were collected for respirable Mn and 18 side by side samples were collected for inhalable and total Mn.

Results: The volume of air sampled ranged from 202.2-1077 liters. Concentration (mg/m³) of respirable Mn by IOM method ranged from 0.00-0.41 (mean±sd; 0.13±0.14) and by conventional method from 0.00-0.51 (0.19±0.18). Inhalable Mn ranged from 0.01- 0.52 (0.20±0.19) and total Mn from 0.01-0.41 (0.21±0.18). Conventional respirable readings, except one, were consistently higher than those of the IOM respirable readings (slope = 0.746; r² = 0.943) and the difference of the means was significant (p < 0.01). The mean concentration of inhalable Mn was not significantly different from the mean of total Mn (slope=1.02; r²=0.921).

Conclusions: The findings of this study suggest that for sampling airborne Mn during SMAW welding: (1) the IOM respirable sampler may not be suitable as an alternative method to the conventional respirable sampler; and (2) the IOM inhalable sampler may be used as an alternative method to conventional total sampler.

SR-127-07

Treated and Untreated Rock Dusts: Silica Content and Physical Characterization

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Objective: To assess the free silica content and physical characteristics of four selected rock dusts consisting of calcium and/or magnesium carbonate, in both treated and untreated form.

Methods: Four selected rock dusts were investigated: AMC (untreated), AMC with X-10 (treated), Micro-White 100 (untreated) and Imerys Phase IV (treated blend of 87.5% Micro-White 100 and 12.5% Kotamite). For each rock dust, two different size fractions (bulk and respirable size fractions) were tested to determine quartz content (%). The selected rock dusts were aerosolized and introduced into an aerosol chamber. A total of 72 individual samples of respirable dust were collected using FSP10 cyclones. Particle size segregating samplings were conducted using a Micro-Orifice Uniform Deposit Impactor (MOUDI). Silica measurement was performed according to NIOSH Method 7603. Particle morphology was examined with a combination of scanning electron microscopy and energy-dispersive x-ray spectroscopy analysis (EDX).

Results: The silica content of AMC in respirable dust (0.84%) was the largest but not significantly different from that of AMC X-10 (0.68%). The Micro-White 100 had significantly lower silica content than the other rock dusts but was not significantly different from Imerys Phase IV. The respirable fraction of AMC dust, treated and untreated, had a significantly higher silica content than did the bulk material. Silica is enriched in the respirable fraction but not above the Mine Safety and Health Administration (MSHA) limit for silica in bulk dust. All particle

size distributions showed log-normal distributions, with the mass median aerodynamic diameters between 1.2 and 5.3 µm and geometric standard deviations less than 2.8. The dust spectra from EDX analysis are predominantly from limestone, clay particles and gypsum particles. No free quartz particles were observed, but that is reasonable considering the low quantity of silica and the number of particles studied.

Conclusions: All four dusts contained respirable silica. Treated rock dusts had slightly lower silica content than untreated ones. Silica can be elevated in the respirable fraction compared to the bulk, but this enrichment is not likely to lead to silica concentrations above the MSHA Permissible Exposure Limit (PEL), provided there is compliance with the PEL for respirable dust.

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Vermiculite Containing Asbestos & Zonolite Insulation

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Situation/Problem: Since the association between asbestos related disease and Libby, Montana vermiculite mining was first proven, products containing vermiculite have consistently been classified as a hazard. In fact, since 2013 all vermiculite insulating materials have been regulated under New York State laws as Asbestos Containing Material (ACM). Further, the EPA states clearly in its homeowner outreach that "YOU SHOULD ASSUME THE VERMICULITE CONTAINS ASBESTOS AND DO NOT DISTURB IT!" Obviously, these approaches to vermiculite insulation are real and impact the lives of property owners and contractors every day.

Resolution: A new method was developed for the sample preparation and analysis of vermiculite containing materials to accurately speciate and quantify the asbestiform mineral which exists in vermiculite containing ores and finished products. This achievement is possible via a technique which chemically dissolves vermiculite and other interfering substances. Scanning Electron Microscopy and Energy Dispersive Spectroscopy speciate and quantify any amphibole species which occur. This technique achieves a detection limit of 0.01%.

Results: The method accurately detects and quantifies asbestiform minerals embedded in vermiculite. In July of 2014, the method (LAB.055.1) received New York State Dept. of Health certification for the analysis of asbestos in Spray-On Fireproofing Containing Vermiculite (SOF-V). Numerous samples have been analyzed including amphibole-spiked fireproofing materials as well as pure Zonolite based insulating products originating from Libby, Montana. The resulting data will demonstrate the unique ability of this technique to not only make 100% of the amphibole species available for inspection, but also to consistently and reproducibly determine the asbestos content in vermiculite containing materials.

Lessons learned: Given the impact and importance of accurately characterizing the amphibole asbestos content of Libby-based vermiculite containing materials, methods capable of accurately and precisely defining the asbestos content are a critical to any health assessments being performed. This work describes the results of one such method and builds awareness of the true asbestos content which exists in those vermiculite containing materials we now treat as asbestos.

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