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PS401

Poster Session 401

Monday, May 23, 2016, 10:00 AM - 12:00 PM

SR-401-01

Collection Efficiency of Membrane Filters for Respirable Size-Selective Sampling

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Objective: To measure the collection efficiency of commercial air sampling filters with polydisperse sodium chloride (NaCl) under different filter pore sizes and sampling flow rates for respirable size selective samplers.

Methods: Collection efficiency experiments were conducted with four different 37 mm diameter membrane filters: mixed cellulose ester (MCE; 0.45, 0.8, 1.2 and 5 µm pore sizes), polycarbonate (0.4, 0.8, 2 and 5 µm pore sizes), polytetrafluoroethylene (PTFE; 0.45, 1, 2 and 5 µm pore sizes), polyvinyl chloride (PVC; 0.8 and 5 µm pore sizes) and silver membrane (0.45, 0.8, 1.2 and 5 µm pore sizes) with polydisperse NaCl in the size range of 10-400 nm. Test aerosols were nebulized and introduced into a calm air chamber through a diffusion dryer and aerosol neutralizer. The testing filters were mounted in a conductive polypropylene cassette within a metal testing tube at the flow rate varied between 1.7 and 11.2 L min⁻¹. A Scanning Mobility Particle Sizer (SMPS, Model 3936, TSI, Inc.) was used to count number particle concentration before (C_{in}) and after (C_{out}) test filters. The different pressure across the filter was measured with a digital manometer. The total number of runs was 1044 (29 filter types with different pore sizes x 4 sampling flow rates x 3 filters x 3 replicates).

Results: In general, the collection efficiency varied with flow rate, pore size, and sampling duration. Collection efficiency and pressure drop increased with decreased pore size and increased sampling flow rate, but they differed among filter types and brand. The collection efficiencies of the MCE, PTFE

and PVC filters were > 92% under all test conditions while the collection efficiencies of the polycarbonate and silver membrane filters were in the range of 40.2 to 99.6% and 38.6 to >99.9%, respectively.

Conclusions: The present study confirmed that the MCE, PTFE and PVC filters have a relatively large collection efficiency for challenged nanoparticles much smaller than their nominal pore size and have significantly larger sampling efficiency than that of polycarbonate and silver membrane filters at large pore sizes. The collection efficiency of polycarbonate and silver membrane filters varied with flow rate, pore size, and time duration. Although collection efficiency increased with decreased pore size and increased flow rate so, also, did pressure drop across the filter.

CS-401-02

Respirable Manganese Exposures During Hand Grinding of Carbon Steel

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Situation/Problem: Since the reduction of the Manganese TLV® in 2012, much of the focus has been in the welding process, since the fume generated is in the respirable range. Industrial hygiene sampling of Manganese has resulted in overexposures inside the welding helmet of typical welding process such as TIG, MIG and SMAW. An allied task to welding is grinding of metal in preparation for the weld and finish grinding after the weld has been made. This evaluation looks to determine if metal dust from hand grinding can result in overexposures to Mn in the respirable range. Preliminary IH sampling indicates there is a potential exposure to Mn in the respirable range based on our surveys.

Resolution: Sampling using parallel particle impactors (PPI) placed in hand grinder breathing zones was conducted. Isolated hand grinders were selected to limit interference from welding fume exposures.

Results: Sampling results ranged from 55% - 700% of the ACGIH® TLV®.

Abstract Book

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