EVALUATION OF FILTER MEDIA FOR ALPHA CONTINUOUS AIR MONITORING IN THE ULTRAFINE PARTICLE SIZE RANGE

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Traditional uses of alpha continuous air monitors (CAMs) have focused on real-time monitoring of airborne plutonium and uranium particles in the workplace (where the typical aerodynamic diameter of such particles is assumed to be 5 μm). Recent interests have increased for use of alpha CAMs to monitor radon decay products (which are typically in the ultrafine particle size range). To learn more about filter performance for CAMs in the ultrafine particle size range, tests were conducted at the National Institute for Occupational Safety and Health to evaluate the most penetrating particle size (MPPS) and collection efficiency as a function of air flow rate for a typical glass fiber filter (Gelman A/E), a typical mixed cellulose membrane filter (Millipore SMWP), and three alternatives of Teflon™ membrane filters (Speclon 1.5, Speclon 5.0, and Millipore FMLB). Because particles of very small size are efficiently collected by diffusion and particles of larger size are efficiently collected by inertial impaction, the tests involved ten monodisperse particle sizes in the range of 0.02 μm to 0.4 μm. As expected, MPPS values for all filters were found to be in the range of 0.02 to 0.06 μm at a flow rate equivalent to typical fixed-area CAM operating conditions of about 30 L/min through a filter of 25-mm diameter. Also, as expected, MPPS increased somewhat to be in the range of 0.05 to 0.1 μm at a lower flow equivalent to typical personal CAM operating conditions of about 3 L/min through a filter of 25 mm diameter. Additionally, as expected, collection efficiencies of the glass fiber, membrane, and small-pore Teflon filters were greater than 99%, and collection efficiency of the larger-pore size Teflon filter (the FLMB) was typically greater than 90%. Unexpectedly, collection efficiency of the other larger-pore Teflon filter (the Speclon 5.0) was only about 60%. These results can assist users in selecting and applying filters for a variety of CAM applications.