

Searching for the best performing respirator filters

Sheng-Hsiu Huang, Chun-Wan Chen, Yu-Mei Kuo and Chih-Chieh Chen

Presented by Chih-Chieh Chen

National Taiwan University, College of Public Health, 17 Xu-Zhou Road, Taipei, Taiwan

ccchen@ntu.edu.tw, Tel: +886-233668086

Theoretical filtration models were used to examine factors affecting filtration characteristics of filters used for respiratory protection. The major operating parameters examined in this work included face velocity, fiber diameter, packing density, filter thickness, and fiber charge density. Characteristics of the most penetrating particle size were also modeled with the same operating parameters.

The results showed that aerosol penetration through electret filter media increases with increasing face velocity and increasing fiber diameter, and decreases as packing density, filter thickness or fiber charge density increase. Face velocity and fiber charge density have more significant effects on filter quality factor than the other factors. Filter quality factor increases with decreasing face velocity or increasing fiber charge density. For electret filters, (1) the most penetrating particle size increases with increasing fiber diameter; (2) an increase in packing density, thickness, or fiber charge density would cause the most penetrating size to decrease, and (3) the most penetrating size through electret filters increases with increasing face velocity and decreasing filter thickness. On the other hand, for non-electret filter media, the most penetrating size increases with decreasing face velocity and the filter quality factor is not affected by filter thickness.