

Contributo dei meccanismi di cattura elettrostatici all'efficienza di filtrazione di facciali filtranti

The contribution of electrostatic effect on the performance of filtering facepiece respirators

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Most filtering facepieces are made of electrically charged filtering materials. This paper assesses the contribution of electrostatic capture mechanisms to the filtering efficiency of some commercially available filtering facepieces.

Filtering facepieces from two different manufacturers were studied. For each manufacturer FFP1 and FFP2 filtering facepieces were examined. Penetration of monodisperse DEHS aerosol through the filtering facepieces was measured in the range $0.02 \div 0.40 \mu\text{m}$ before and after the removal of the electric charge from the filtering material.

For all the facepieces the charge removal caused a penetration increase and a shift of the most penetrating particle size from lower than $0.07 \mu\text{m}$ to larger than $0.15 \mu\text{m}$ diameters. The maximum contribution to filtering efficiency by electrostatic capture mechanisms ranged between 36% and 53%. This was at particle diameters of 0.20 or $0.30 \mu\text{m}$ whereas it was much lower for the smallest particles in the studied range.

In the studied range, except for the smallest particles, the presence of the electrostatic capture mechanisms is basic for the protection offered by the filtering facepieces. A significant difference in technical design between the two manufacturers was noted: in a case FFP2 filtering facepieces showed a mechanical filtering efficiency greater than FFP1, in the other case the mechanical filtering efficiency was about the same for facepieces of different classes. The efficiency reduction caused by electric charge removal was different for each facepiece. This reduction was not related to the class of the facepieces but depended on the technical designs used by the manufacturers.