

Facile method for the regeneration of electret filters by triboelectrification

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We developed a facile and efficient method for regenerating the electrostatic potential of electret filters by contact electrification. A commercial polypropylene (PP) electret filter (PEF) for face masks was used to investigate its filtration efficiencies for particulate matters (PMs) of solid fine dusts and liquid droplets containing airborne bacteria (bioaerosol). The filtration efficiency of a pristine PEF for fine dust was 72.4% but decreased to 62.7% following the removal of electrostatic charges in PEF by ethanol treatment. In contrast to fine dust, the bioaerosol (BA) removal efficiency of the filter was not affected by ethanol treatment because liquid droplets did not wet and infiltrate the hydrophobic PEF surface. The electrostatic potential of PEF was restored or even increased by simple rubbing with Teflon that has a large triboelectric charge density. The resulting PM removal efficiency was higher than that of pristine PEF and no performance deterioration even after 10 regenerations. The method developed to be able to reuse disposable face masks helps to cope with the global infectious diseases and reduce environmental problems.