

### ***S3.2.3 Enhancement of Nanoparticle Removal for HVAC and Indoor Air Cleaner Filters by Adding Nanofibers***

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Pleated electret HVAC filters are often used in residence to mitigate the particles that originate both indoors and outdoors. These filters are usually tested with particles larger than 300 nm. However, residential particles can contain a significant amount of nanoparticles with size below 50 nm due to cooking, smoking, cleaning, wood burning and outdoor infiltration. Especially, the outdoor nanoparticle infiltration is severe in China due to the high PM<sub>2.5</sub> concentration. In order to characterize the nanoparticle removal by electret HVAC filters, penetrations of 3-500 nm silver nanoparticles through five different flat sheet electret media used in commercial residential HVAC filters were tested with face velocities of 0.05, 0.25, 0.5 and 1.0 m s<sup>-1</sup>. Experimental results showed that all media had significantly high penetrations with 0.35-0.8 at the most penetrating particle sizes (MPPSs) for all three velocities, which were in the sizes of 10-30 nm. A model based on single fiber theory for particle penetration predictions was used and compared with the experimental data. Results showed that the model predicted the nanoparticle penetrations very well for all media and all face velocities tested. According to the model, for enhancing the nanoparticle efficiency of the current commercial HVAC filters, the fiber diameter should be reduced or the number of pleats should be increased. This encourages us to try to enhance the nanoparticle removal efficiency by adding different types of nanofibers. The media performances, in terms of the figure of merit are shown and compared.