

EFFECTS OF RELATIVE HUMIDITY ON THE FILTRATION PERFORMANCE OF CHARGED FILTER MEDIA

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In the filtration tests, filter media are usually challenged with particles under low relative humidity (RH) conditions, e.g., $RH < 30\%$. However, the filters applied in HVAC system are experiencing varied RHs from low on dry sunny day to extremely high on raining day. There remains unclear of the effects of water molecules on the filtration performance, especially for charged filters that are widely applied in HVAC system. The water vapors may affect the filtration performance on two aspects of: 1. charge neutralization for fiber charges, and 2. the changes of the structures of both incoming and already deposited particles if they are water soluble. It is very important to conduct well-controlled experiments to clarify the RH effects. Our preliminary results show that the charge neutralization is almost negligible even immersing the charged media in water for one day. For water soluble ammonium nitrate, NH_4NO_3 , as the challenging particles, the holding capacity increases with increasing RH. Composite particles with a close $PM_{2.5}$ size distribution of ambient particles, containing different mass fractions of water soluble and non-hygroscopic compositions are prepared to investigate the loading performance of many commercial charged filters.