

# Filtration characteristics of air filter loaded with differently charged particles

H.S. Park

Climate Change Research Division, Korea Institute of Energy Research, Daejeon, 305-343, South Korea

Keywords: filtration, loading, particle charge.

Presenting author email: phs@kier.re.kr

Once a new air filter is applied to an air purification process, the filter becomes loaded with dust particles. Thus, the study on the particle loading characteristics of air filter is very essential in order to understand the real filtration phenomena during filter use. In this study, the effect of particle and filter charge on the particle loading property of air filter was investigated.

Charged filter and uncharged filter prepared by discharging the charged filter by isopropyl alcohol were used as test samples, and three types of particle having different charge states were supplied to filters tested. Fig. 1 is a schematic diagram of filter test apparatus. As a filter is continuously loaded with particles, the pressure drop of the filter was monitored and collection efficiency was calculated by periodically measuring particle concentrations at upstream and downstream of filter.

For neutralized particles there was a big difference in areal mass loading rates between charged and uncharged filters due to the very small amount of particle charge, on the other hand the difference was diminished for atomized particle and finally almost vanished for corona charged particles. As shown in Fig. 2, the pressure drop of filter loaded with corona charged particles was only half of those for neutralized and atomized particles at the same areal mass loading because of the porous structure of particle deposit formed on filter fibers (Fig.3), caused by the repulsive forces between particles.

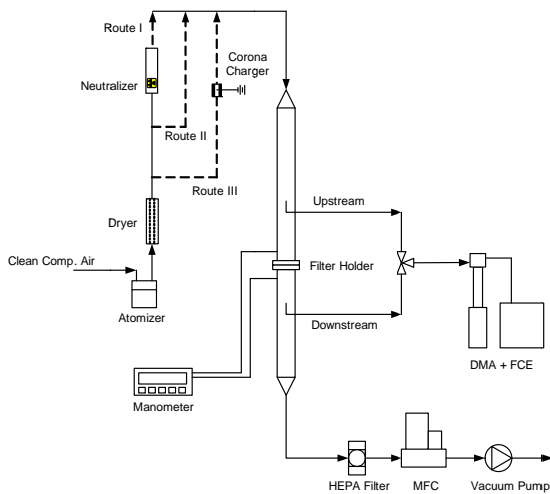


Figure 1. Schematic diagram of filter test apparatus used in this study.

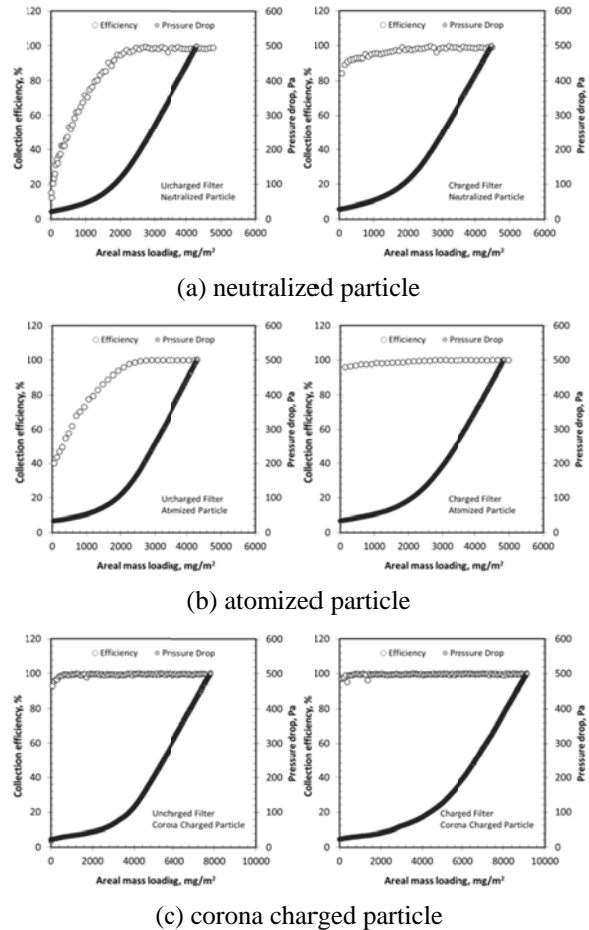
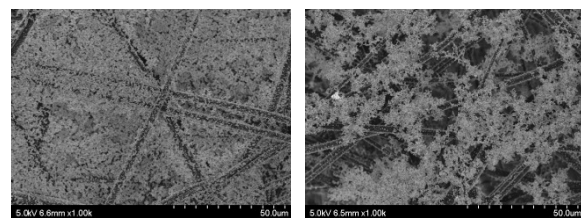


Figure 2. Collection efficiency and pressure drop of air filter loaded with differently charged particles.



(a) neutralized (b) corona charged

Figure 3. Deposition patterns of particles on electrically charged filter.

This study was supported by the Converging Research Center Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology.