LOW-EFFICIENCY FILTER LOADING CHARACTERISTICS IN LOW RELATIVE HUMIDITY ENVIRONMENT

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ABSTRACT

In this study two low efficiency cellulose filters were loaded with sodium chloride (NaCl) and potassium chloride (KCl) particles of supermicron sizes in low relative humidity (RH) environments (i.e., RH < 30%). Because that NaCl and KCl particles have similar material properties, such as density and crystal structure, it was believed that no difference would be observed in the filter loading curves (i.e., pressure drop vs. the loaded particle mass/volume) of particles of the same size in such low RH environments. In this work it is shown that at 30% RH the initial penetration and the loading curves of filters loaded with NaCl and KCl particles are nearly the same. However, as the RH decreased to 15%, the loading curve of NaCl particles deviated from that of KCl. The curve of NaCl particles moved to the right of the KCl curves. In other words, with the same pressure drop, the filter can be loaded with more volume of NaCl particles than KCl particles. Further, the influence of filter structure and particle size on the loading curve shifting was investigated by performing the same loading test with two different particle sizes. It was found that the observed RH effect on the loading curve was more significant for low efficiency filters loaded with large super-micron particles. SEM examination of test particles found that the morphology of test particles is different when RH is varied. It was thus concluded that a possible reason for the dissimilarity of the NaCl particle loading curve at 15% RH is the difference in the particle morphology.

***Keywords*:** Particulate Filter Loading, Relative Humidity Effect, Particle Morphology