

# Loading of Nanofibrous Filter Media with Solid Aerosol Particles – Experimental and Modeling Study

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## Abstract

Nanofibers, due to small fiber diameters have higher capture efficiencies in the sub micron particle size range of 0.3-0.8 micron than microfibers due to increased surface area of the fibers. Pressure drop across the filter increases tremendously with decrease in fiber diameter in the continuum flow regime. Nanofibers with fiber diameter less than 300 nm are in the slip flow regime and steep increase in pressure drop is considerably reduced due to slip effect. Thus, nanofiber augmented filter media have higher capture efficiency for the entire particle size range with considerably less increase in pressure drop. The economic benefits of augmenting nanofibers to microfibers are smaller filter and higher capture efficiency. Desired amount of electrospun nanofibers are added as surface coating onto the microfiber based filter media or uniformly mixed with microfibers using vacuum molding technique. A mathematical model is developed to predict the performance of nanofibrous filter media loaded with solid particles and loading test are carried out using TS1 8130 to compare with modeling results. The mathematical model is done to predict the filter performance of uniformly mixed nanofiber and microfiber filter media and compared with experimental results for different flow rates of aerosol. A comparative study on the augmentation of nanofibers as a surface coating on a microfibrinous layer or as a uniformly mixed additive with microfibers will be done.

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