

# Nanofiber based filter Media for Coalescence Filtration

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Electrospun polymer and ceramic nanofibers have immense potential for liquid/liquid, gas/liquid and gas/particle separations. Experimental results show that Nylon 6 nanofibers mixed with B glass fibers performed better than microfiber filter media in coalescence filtration tests. High temperature durable  $\text{TiO}_2$  and  $\text{Al}_2\text{O}_3$  nanofibers can be incorporated in filters and used for high temperature applications in furnaces and process industries for the cleaning of exhaust and hot gases. Coalescing filter media augmented with nanofibers increases the surface area available for capture of the droplets. The diameters of nanofibers are so small that the gas phase “slips” around the fibers and the corresponding increase in pressure drop is not as large as when microfibers are used. Hence there is an increase in the quality factor of the filter. To obtain nanofibers the different electrospinning parameters such as the viscosity and concentration of sol, electric field and flow rate of the mixture need to be optimized. Polymer nanofibers have been produced by dissolving the polymer in a solvent or in a solvent mixture and electrospinning the mixture. For example, nylon has been electrospun using formic acid as the solvent. Ceramic nanofibers have been fabricated by mixing a ceramic precursor with a polymer and then electrospinning it to get a mat of nanofibers possessing the ceramic precursor/polymer composite. This composite mat is calcined at temperatures in the order of 500-600 °C to degrade the polymer and obtain pure inorganic ceramic nanofibers. Aluminium acetate and titanium isopropoxide have been used as the ceramic precursor to fabricate  $\text{Al}_2\text{O}_3$  and  $\text{TiO}_2$  nanofibers respectively. These nanofibers are incorporated into the filter media by vacuum molding process where they are mixed with microfibers, binder and starch. This paper discusses the details of production and processing of polymeric and ceramic nanofibers for coalescence filtration applications.