STUDY ON FILTRATION PERFORMANCE OF NANOPARTICLE COATED ELECTROSTATIC FILTERS

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The mechanism of air filtration can be divided into four major methods, including inertial impact, interception, gravitational settling and diffusion. However, the combined filtration efficiency decreases in the region between100 nm to 400 nm. It was found that the electrostatic force of an electrostatic filter can be used to enhance the filtration efficiency in this region. However, captured oil mist can significantly decrease the stored electrostatic charges on the electrostatic filter and can rapidly decrease its filtration efficiency. In this paper, we report our study on coating nanoparticles on an electrostatic filter to enhance its filtration performance for the application of oil mist filtration. A standard polypropylene (PP) electrostatic filter with diameter ranges from 100 nm to 450 nm was used. Al2O3 nanoparticles with dimension less than 100 nm was sprayed and flowed into the PP filter. Nanoparticles are randomly coated on its fiber network. Thus, nanoparticles be used to minimize oil spreading and masking of PP fibers. The method of surface treatment was based on using an atomizer to 40.1 nm to 732.6 nm aerosols containing nanoparticles, and different amount of nanoparticle coatings is studied. Electrostatic surface potential of treated PP filters was studied, and it is found that its value is 46% higher than non-treated PP filters. We will demonstrate that the surface characteristics of the charged polypropylene filter can be changed after nanoparticle treatment and the adsorption of oil mists decreases. Its contribution to the filtration efficiency will also be presented.