High-performance electret and antibacterial meltblown nonwovens doped with nanoparticles of boehmite and ZnO for air filtration

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Abstract

The current pandemic caused by Covid-19 triggered intensively the development of high-performance air filters. Polypropylene (PP) is widely used as the raw material of meltblown nonwovens that is the core layer in air filters, such as, masks. In this study, an electret PP meltblown nonwoven with antibacterial activity was developed, and nano boehmite (AlOOH) and nano-ZnO employed as electret and antibacterial agent, respectively. 0.5-2.0 wt% of AlOOH and 1.0 wt% of ZnO were doped into PP matrix using a twin-screw extruder and the resulting masterbatches applied as raw materials to afford nonwovens via a meltblown process. The as-prepared nonwovens were characterized by means of SEM, IR and DSC/TG, and after corona charging, the filtration efficiency, charge decay and antibacterial properties were evaluated. More than 1.0 wt% dosage of AlOOH endowed the nonwoven with high filtration efficiency and 1.0 wt% of ZnO brought about antibacterial activity. Corona charging was an effective means to make the nonwovens electret charged and the charges were quicker to decay in air than in a sealed bag. The as-prepared meltblown nonwoven would be a remarkably promising filter in air filtration.

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