Customizing the porosity characteristics of activated carbon nanofibers prepared from a blend of lignin with recycled PET

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Abstract

Lignin is the second most abundant natural polymer on earth behind cellulose. It is a major natural source of aromatic compounds and it represents around 25–30 % of the total non-fossil organic molecules on our planet. On the other hand, poly(ethylene terephthalate) (PET) is one of the most common commodity plastics, and the most widely recycled plastic in the USA in terms of weight. The utilization of a biorenewable (lignin) and a waste material (recycled PET) for the manufacture of high added-value products can be an issue of increased importance in the era of escalating environmental concerns. In this research, these two raw materials were combined for the preparation of activated carbon nanofibers. Initially, precursor nanofibers were fabricated using the electrospinning technique, and subsequently they were carbonized and activated under various conditions. It was found that by adjusting the lignin/PET mass ratio and the average diameter of the precursor fibers it was feasible to prepare activated carbon nanofibers with different porosity characteristics. A detailed characterization of the carbon nanofibrous structure will be presented and discussed.