

Preparation and Modeling Carbon Nanofibers as an Adsorbent to Protect the Environment

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Abstract : Carbon nanofibers possess properties that are rarely present in any other types of carbon adsorbents, including a small cross-sectional area, combined with a multitude of slit shaped nanopores that are suitable for adsorption of certain types of molecules. Because of their unique properties these materials can be used for the selective adsorption of organic molecules. On the other hand, activated carbon fiber (ACF) has been widely applied as an effective adsorbent for micro-pollutants in recent years. ACF effectively adsorbs and removes a full spectrum of harmful substances. Although there are various methods of fabricating carbon nanofibres, electrospinning is perhaps the most versatile procedure. This technique has been given great attention in current decades because of the nearly simple, comfortable and low cost. Spinning process control and achieve optimal conditions is important in order to effect on its physical properties, absorbency and versatility with different industrial purposes. Modeling and simulation are suitable methods to obtain this approach. In this paper, activated carbon nanofibers were produced during electrospinning of polyacrylonitrile solution. Stabilization, carbonization and activation of electrospun nanofibers in optimized conditions were achieved, and mathematical modelling of electrospinning process done by focusing on governing equations of electrified fluid jet motion (using FeniCS software). Experimental and theoretical results will be compared with each other in order to estimate the accuracy of the model. The simulation can provide the possibility of predicting essential parameters, which affect the electrospinning process.

Keywords : carbon nanofibers, electrospinning, electrospinning modeling, simulation

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