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Electrospun nanofibers as sorbents for the concentration of organic toxicants from aqueous media

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Abstract

The application of new solid phase sorbents on the basis of nanofibres (nonwovens materials) and their composites for the concentration of organic toxicants – the priority pollutants of water bodies is considered. Advantages of electrospun nanofibers are: high specific surface area; highly porous structure; variability of fiber diameter and interfiber distance; improved mechanical properties; the possibility of covalent impregnation of functional groups, etc. Methods for obtaining nanofibres are given by: 1) drawing out long fibers; 2) the template method (nanofilter method); 3) electrospinning. The latter received the largest distribution, which is realized in two versions: capillary and non-capillary. This article is gave a general idea of the potential of using such nanofibers obtained by electrospinning as sorbents of various organic toxicants. Four approaches to obtaining nanofibers for the sorption of various organic analytes have been identified. The first is based on the electrospinning of the solution of the individual polymer. The second is based on the preparation of a solution of a mixture of polymers of various nature, then electrospinning. A third method for obtaining a nanofiber sorbent is to produce a composite based on nanofibers and metal, metal oxides or non-metals nanoparticles. The fourth differs from the first three methods in the step of modifying the surface of the previously obtained nanofiber. The requirements for solvents of the original solid polymers have been determined. Examples of the application of materials obtained by the above methods as sorbents of organic compounds of both hydrophilic and hydrophobic nature from various aqueous media are given. The conditions for the sorption extraction of the compounds to be determined in static and dynamic regimes and certain metrological characteristics (extraction degree, sorption capacity, limit of detection, etc.) are indicated.

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