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Encapsulation of isoquinoline in a polymer nanocontainer based on the CU-2-4 sulfocationite

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Abstract

The possibility of the encapsulation of isoquinoline in the nanocontainer on the matrix of the sulfonated copolymer based on styrene and divinylbenzene (CU-2-4 sulfocationite) has been researched. The encapsulation of isoquinoline in the nanocontainer on polymer matrix was performed by ion-exchange sorption from aqueous solutions. CU-2-4 sulfocationite in hydrogen and isoquinoline forms was studied by NMR and Fourier IR spectroscopy. In the ^{13}C NMR spectra of solid-state samples of the CU-2-4 cation exchanger in the isoquinoline form is observed additional resonance absorption band of ^{13}C in the range of chemical shift 136 ppm, corresponding to the nodal carbon atom of the pyridine ring. The IR spectrum of the polymer containing the encapsulated isoquinoline be observed bands characteristic for skeletal vibrations in the area of isoquinoline fingerprints (1300-1600 cm^{-1}) and the band of 938 cm^{-1} that corresponds to the deformation vibrations of the CH-group of pyridine ring, which is not in the spectrum of the H-form sulfocationite. The ion-exchange capacity of the nanocontainer based on CU-2-4 sulfocationite for isoquinoline was 5.5 meq/g. This corresponds to the content of ionogenic groups in the polymer. The dynamic ion-exchange capacity of sulfonated CU-2-4 cation exchanger during encapsulation of isoquinoline coincides with the ion-exchange capacity of sulfonated cation exchanger upon the release of isoquinoline from the polymer nanocontainer. The content of immobilized isoquinoline in the nanocontainer on the CU-2-4 matrix reaches 71 % by weight of the polymer. It is shown that isoquinoline is encapsulated and desorbed with the solution of hydrochloric acid at the same rate. Encapsulated isoquinoline is completely released from the polymer by desorption with the aqueous hydrochloric acid solution. The half-life during sorption and desorption (release) of isoquinoline is approximately 400 seconds. It is shown that the encapsulated isoquinoline to be completely released from the polymer by desorption with an aqueous hydrochloric acid solution. The kinetics of the encapsulation and release of isoquinoline from the nanocontainer based on CU-2-4 sulfocationite is determined by its diffusion in the polymer phase.

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