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Sulphonated network polymers as containers for bioactive substances

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Abstract

Encapsulation of bioactive substances into polymeric containers is one of the promising areas of drug discovery prolonged action. In this paper, sulphonated network polymers were used as containers for bioactive substances (pyridine carboxylic acids). The possibility of immobilization of the nicotinic (NC) and isonicotinic (INC) acids in sulfocationite CU-2-8 and sulfonated polycalixarene has been researched. The dynamic ion-exchange capacity of sulfonated network polymers at process of sorption of NC and INC from solutions has been measured. The capacities of CU-2-8 for both acids above the policalixarene capacities. The ion-exchange capacities of the sulfocationite CU-2-8 and sulfonated polycalixarene are 1.89 mol/dm^3 and 0.61 mol/dm^3 at sorption of nicotinic acid. These values correspond to the content of sulfonic acid groups in the polymer. The ion-exchange capacities of the sulfocationite CU-2-8 and sulfonated polycalixarene are 1.26 mol/dm^3 and 0.52 mol/dm^3 at sorption of isonicotinic acid. ^{13}C and ^{15}N NMR spectra of solid-state samples of the nicotinic acid, the salt $(C_6H_6NO_2)_2SO_4$ containing the protonated form of nicotinic acid, and the sulfonated polymers free or filled by nicotinic acid were analyzed. It was shown that the immobilized pyridine carboxylic acid exists in the protonated form. The kinetics of immobilization (adsorption) and release (desorption) of pyridine carboxylic acids from polymeric containers were researched by dynamic and static methods. The sorption rate of protonated and molecular forms of pyridine carboxylic acids are identical in each polymer. The sorption rates of both NC and INC acid are coincide. The rate of release of pyridine carboxylic acid from the polymer container depends on the eluent pH. Time of release of pyridine carboxylic acid from polymers at eluting by water exceeds the time of desorption using of hydrochloric acid as the eluent.

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