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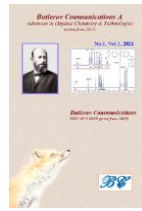

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Solid state nanoreactor. Part 10.

Separation of binary mixtures of pyridine-3-carboxylic acid with copper nitrate or iron chloride on CU-2 sulfonic cation exchanger

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Abstract

The growing global demand for nicotinic acid and its derivatives stimulates the improvement of existing and the search of new technologies for the production of nicotinic acid, including those based on liquid-phase oxidation of pyridine bases with metal salts as catalysts. In this regard, the study of sorption processes in systems containing ion exchangers, solutions of nicotinic acid and metal cations is relevant.

The sorption processes of pyridine-3-carboxylic acid (NC_5H_4COOH, nicotinic acid, NC) from aqueous solutions by KU-2 sulfonic cation exchanger containing copper(II) and iron(III) were studied in that work. The distribution coefficient values of nicotinic acid between the phases of the solution and the polymer in the studied concentration range are in the range 25-35 in the case of CU-2-Cu and reache 100-250 for CU-2-Fe. According to FTIR spectroscopy, material balance of sorption processes, and the principle of electroneutrality in the polymer phase, Fe^{3+} cations interact with the nicotinic acid anion (L^-) forming $[FeL]^{2+}$ complexes, Cu^{2+} cations interact with nicotinic acid HL molecules through nitrogen of pyridine ring forming $[CuHL]^{2+}$ complex cations. Hydrolysis of $[FeL]^{2+}$ and dissociation of $[CuHL]^{2+}$ in the polymeric phase make it possible to desorb nicotinic acid from the polymer by distilled water to obtain a metal free eluate. The output curves of the nicotinic acid and metal cations sorption from solutions of binary mixtures of acid with copper nitrate or iron chloride on KU-2 and the subsequent nicotinic acid desorption by distilled water were obtained. It is shown that the adsorption of the mixture components on a cation exchanger and subsequent elution with distilled water allows the separation of nicotinic acid from copper and iron cations on a small sorbent layer.

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