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Improved Polyelectrolyte for Ion Exchange Fibers

An improved technique increases the ion exchange capacity of hollow-fiber-substrate ion exchange resins. These resins are described in NASA Tech Brief B75-10117. They are made by impregnating hollow fibers with two monomer species which spontaneously polymerize in the pores of the fibers. The pores of the treated fibers then contain a uniform distribution of cross-linked ion exchange molecules.

A typical monomer pair used to form the resin is 4-vinyl pyridine and a dihalide. A modification to the original procedure has been developed which increases the number of quaternary sites on the polyquaternary copolymer by about 15 to 35 percent. The improvement is effected by a post-polymerization treatment that includes reacting any residually bound halogen with an amine to introduce additional quaternary groups into the resin.

The reaction is best carried out with a tertiary amine; however, primary or secondary amines may be used and followed with a quaternization reaction. Typical amines suitable for the process are trimethyl amine (TMA), benzyl dimethyl amine, and pyridine.

If a gaseous amine such as TMA is used, the reaction may be conducted at atmospheric or elevated pressure by merely placing the preformed cross-linked resin in contact with the gas. One method is to immerse the resin in methanol and to bubble the amine gas through the solvent. With liquid amines, the reaction may be carried out by immersing the resin in the amine or a solution of the amine. The reaction proceeds readily at room temperature, but the rate increases at higher temperatures (i.e., 40° to 100° C).

Note:

Requests for further information may be directed to:

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Reference: TSP75-10280

Patent status:

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457(f)], to the California Institute of Technology, Pasadena, California 91109.

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Category: 04 (Materials)