

PURPOSEFUL FORMATION OF INORGANIC PARTICLES IN ION EXCHANGE AND INERT POLYMERS

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Main regularities for precipitation of inorganic modifiers inside ion exchange (weakly and strongly acidic as well as strongly basic; flexible and rigid) and inert polymers are considered. The Ostwald-Friendlich equation was applied to obtain the relations, which allows us to determine the conditions for purposeful formation of one or other particles (non-aggregated nanoparticles, aggregates and agglomerates). The obtained composites were investigated with methods of transmission and scanning electron microscopy, standard contact porosimetry, ³¹P NMR spectroscopy. In the case of embedded phosphate compounds, the spectra show 2 signals that are attributed to hydro- and dihydrophosphate groups (aggregated particles) or several signals (single nanoparticles). The effect of temperature, solvent viscosity, concentration of impregnating salts and precipitators, ion exchange capacity of the polymer matrices are considered. It was shown that the nature of the modifier plays a key role. For instance, particles of oxides are smaller than those of phosphates. As a result, oxides are deposited in active layer of the membranes for filtration processes, phosphates are formed only in the macroporous substrate. Namely oxide particles provide rejection ability of the membranes: the separators are transformed from microfiltration into ultrafiltration or nanofiltration materials. Regarding ion exchange polymers, the incorporated particles can be formed both in hydrophilic and hydrophobic pores. The particles provide additional swelling pressure squeezing and stretching pore walls. The parameters, which characterize effect of the embedded particles, have been proposed. Additional hydrophobic micropores are formed in the polymer matrix. When the species being sorbed are rather large, for instance, cations or anions of uranyl, sizes of some micropores and ions can be comparable. As a result, these micropores are selective centers: sorption isotherms are described by the Dubinin-Radushkevich model. Stretching of pores results in enlargement of the distance between functional groups of the polymer accelerating ion transport.