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# Thin porphyrin composite membranes with enhanced organic solvent transport

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## Abstract

Extending the stability of polymeric membranes in organic solvents is important for applications in chemical and pharmaceutical industry. Thin-film composite membranes with enhanced solvent permeance are proposed, using porphyrin as a building block. Hybrid polyamide films are formed by interfacial polymerization of 5,10,15,20-(tetra-4-aminophenyl)porphyrin/m-phenylene diamine (MPD) mixtures with trimesoyl chloride. Porphyrin is a non-planar molecule, containing a heterocyclic tetrapyrrole unit. Its incorporation into a polyamide film leads to higher free volume than that of a standard polyamide film. Polyamide films derived from porphyrin and MPD amines with a fixed total amine concentration of 1 wt% and various porphyrin/MPD ratios were fabricated and characterized. The porphyrin/MPD polyamide film was complexed with Cu(II), due to the binding capacity of porphyrin to metal ions. By coupling scanning transmission electron microscopy (STEM) with electron energy-loss spectroscopy (EELS), Cu mapping was obtained, revealing the distribution of porphyrin in the interfacial polymerized layer. By using porphyrin as amine-functionalized monomer a membrane with thin selective

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