THIN FILM MEMBRANES FOR MOLECULAR SEPARATIONS

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Membranes have had a huge impact in molecular separations in aqueous systems, especially desalination. It is generally accepted that 40-70% of capital and operating costs in chemical and pharmaceutical industries are dedicated to separations; and a substantial fraction of this cost is related to processing of organic liquids. Membrane technology has the potential to provide game changing alternatives to conventional concentration and purification technologies such as distillation, liquid extraction, adsorption and chromatography, through Organic Solvent Nanofiltration (OSN) [1]. The membranes must offer resistance to organic environments, attractive selectivities and permeance. Ideally they should also be resistant to physical aging under use.

This presentation will focus on research into advanced membranes for OSN and their applications. Thin film composite membranes, created by interfacial polymerisation (TFC-IP) and activated by a strong solvent, have excellent flux and rejection [2]. Intrinsic microporosity can be preserved through polymer molecular structure [3]. Further, the performance in OSN can be improved by mixed matrix membranes. Metal-organic frameworks (MOFs) have been used to create mixed matrix thin film nanocomposite (TFN) membranes [4] containing 50-150 nm MOF nanoparticles. Finally new membranes for liquid separations can have intrinsic microporosity imparted through choice of the monomers used in membrane formation [5].

Finally, some of the key applications and expected future developments of OSN will be introduced [1], and the potential for ultra-high permeance membranes to impact on actual molecular separation processes will be discussed, including the relative merits of selectivity, permeance and stability [6].

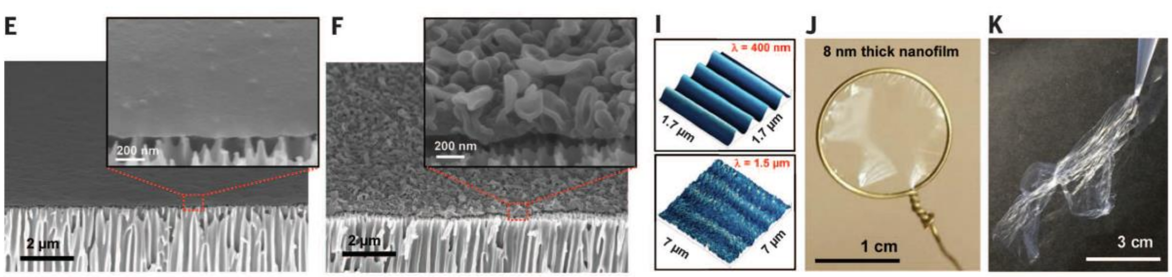

Figure 1 – Thin polyamide films 8 nm thick showing smooth and crumpled structures [from 2]

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