

Poster MS6

A Novel Supercritical Fluid Deposition Process for Sol-Gel Preparation of Silica-Based Membranes

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A novel "On-Stream Supercritical Fluid deposition" (OS-SFD) process has been investigated in this work coupling the sol-gel chemistry and a filtration/compression-based deposition method in supercritical CO₂ (sc-CO₂), for the production of uniform membranes on/in porous tubular supports. The versatility of this process allows both the direct formation of thin coatings on porous tubular membrane supports but also their internal modification. An attractive on-line control of the deposition process was operated by recording the transmembrane pressure evolution during membrane formation. Silica membranes were directly deposited on macroporous supports (155 mm long α -alumina support coated with a 200 nm pore size internal layer) from TEOS derived sols dissolved in sc-CO₂ and transported to the internal layer of the support where condensation/gelation and deposition occurred.

The optimized crack-free silica membranes prepared at 50°C have a compact microstructure and exhibited a thermal stability up to 400°C. A second deposition run on overheated membranes allowed to recover a molecular sieving behaviour with a thermally activated transport for Helium up to 350°C. These promising results demonstrate the potential of this novel method for the preparation of uniform molecular sieve membranes deposited directly on macroporous supports with virtually zero waste.

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