Sub-Angstrom Molecular Differentiation using Carbon Molecular Sieve Membranes

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Molecular separation processes are essential in the production of clean water, pharmaceuticals, specialty chemicals, and fuels. 40-60% of the energy used in the production of these materials is spent on separation processes, which amounts to approximately 5-10% of the worldwide energy consumption. In downstream chemical processes, selective removal of high-valued chemicals is required for the production of synthetic fibers, solvents, and films and is currently performed using energy-intensive techniques such as (cryogenic) distillation. Membrane-based processes have strong potential to further reduce the energy intensity of chemical separations when advanced materials are integrated with the scalable membrane platform. In this talk, molecularly-selective membranes derived from carbon molecular sieve (CMS) will be presented. These membranes have shown excellent chemical resistance, high molecular selectivity and fast mass transport across the membrane. The asymmetric CMS hollow fiber membranes have significant potential for utilization in organic solvent separations, as they exhibit reduced solvent-induced swelling and possess high selectivity for similarly sized molecules.