Carbon Nanotube Membranes:
Novel Membrane Platform for Energy Efficient Separations

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Because of their atomic smoothness and hydrophobicity, carbon nanotubes are extremely efficient pores. The measured gas flow through carbon nanotubes exceeded predictions of the Knudsen diffusion model by more than an order of magnitude. The measured water flow exceeded values calculated from continuum hydrodynamics models by more than three orders of magnitude and is comparable to flow rates extrapolated from molecular dynamics simulations and measured for aquaporins. This unique nanofluidic phenomenon of fast flow through carbon nanotubes promises to open a wide application space for membranes with carbon nanotube pores. The extremely high permeabilities of pressure or chemical gradient driven carbon nanotube membranes will enable energy efficient filtration and eventually decrease the cost of water desalination and of separations of industrial gases and biomolecules. I will introduce the unique features for carbon nanotube membranes and discuss scaleup and commercialization potential for these membranes.