# Liquid transport mechanisms and surface interactions in nanoporous materials

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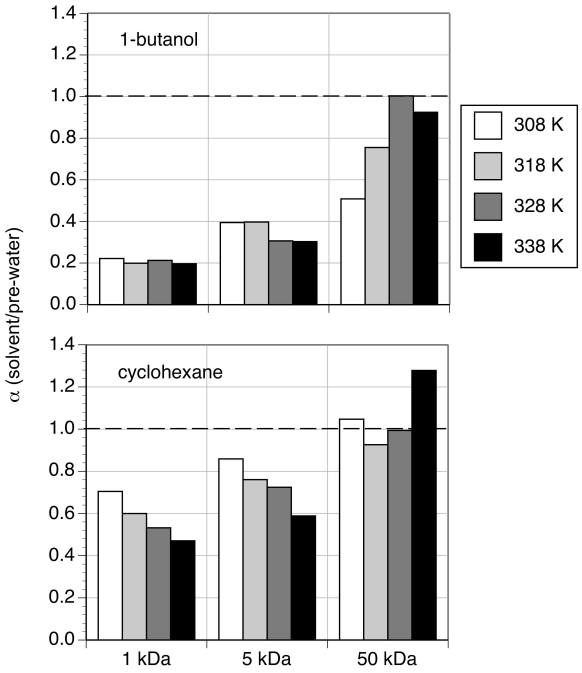
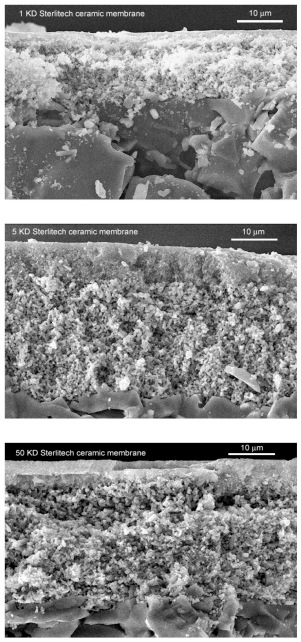
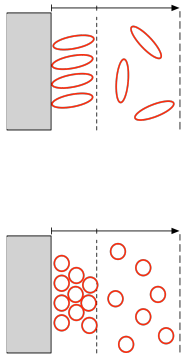
In nanoporous materials, solvent-surface interactions can greatly influence liquid transport behavior. This behavior is difficult to quantify *a priori*. Our research examines solvent transport through ceramic membranes, as model nanoporous materials, to elucidate these interactions as a function of the chemical and physical properties of the solvent and membrane.

Based on solvent permeability, coupled with surface analysis, we have identified how chemisorption (e.g. 1-butanol) and solvation forces (e.g. cyclohexane) affect permeability as a function of membrane pore diameter (ca. 8, 18, and 33 nm). *The reduction in the $\alpha$-parameter, shown in the graph below, demonstrates how the length scales for these interactions competes with the pressure driving forces at smaller pore sizes.*



$$J = -\frac{1}{\eta}\alpha k_m^{water}\Delta P$$

**Adsorption and orientation**
1-Butanol chemisorbs, reducing effective pore size and imparting hydrophobicity

**Solvation or oscillatory force**
Cyclohexane physisorbs and packs near the surface, reducing pressure driving force