Water storage and transport properties in metal organic nanotubes

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Nanotubular materials are highly desirable due to their enhanced porosity and unique properties, but the targeted design of novel nanotubes with controlled chemical and physical characteristics remains challenging. Single-walled carbon nanotubes are the current gold standard, as they are highly versatile and possess fascinating properties, including ordered water and fast transport through nanotubes with small (0.8 - 2 nm) internal diameters. In recent years, metal-organic nanotubes (MONs) have gained interest as they offer the possibility of targeted structural engineering and tunable properties based upon the hybrid nature of the material. The Forbes research group has recently synthesized and structurally characterized a unique MON that displays permanent porosity and thermal stability. This compound contains ordered water that structurally resembles ice (I_h) and exhibits low-temperature, reversible water adsorption that can be tuned by solvent polarity. This presentation will focus on the unusual behavior of the confined water molecules and the structural components that control water mobility throughout the nanotubes.