Adsorption and separations processes within metal-organic frameworks through neutron scattering

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Metal organic frameworks (MOFs) are crystalline materials that contain metal-ions or metal-ion clusters as nodes and organic ligands as linkers to form 1-, 2-, and 3-D structures. Their structural versatility and multifunctional properties have sparked much interest in advanced materials synthesis. Due to their modular nature, many of these materials can be constructed by design. Over the last decade there are several MOFs that reportedly have high surface areas allowing them to physically adsorb significant amounts of gas and/or exhibit significant separations performance. Adsorption of molecules in functionalized and high surface area microporous materials is of technological importance in a multitude of areas ranging from catalysis, drug delivery, chemical separations, and energy storage to personal care products. Through careful selection of the ligand and metal, which control pore size/shape and MOF-adsorbate interactions, their uptake properties can be tuned. Over the past several years we have focused our research efforts on understanding the properties of gas interactions within a variety of microporous materials with the goal of improving new optimal storage and separation materials.