Tuning pore dimension of MOFs for light hydrocarbon separation

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The metal organic framework (MOF) is highly porous and has flexible structure. In this work, Magnesium-MOF-74 (Mg-MOF-74) is used. The Mg-MOF-74 has one-dimensional channel with pore diameter near 1.1nm. Its pore size is too large to separate molecules in molecular scale. To tune the pore size of Mg-MOF-74, ligands are partitioned into the pore of MOF. 2,4,6-Tri(4-pyridyl)-1,3,5-triazine (tpt) can be partitioned into the pore of Mg-MOF-74, through the interaction between nitrogen atom of tpt ligand and open metal site of magnesium. Ligand partitioned Mg-MOF-74 will be characterized through Powder X-ray Diffraction (PXRD) and Matrix-Assisted Laser Desorption Ionization. Also the adsorption isotherm data analysis are used to characterize the pore structure. In order to test the separation performance among methane (C_1), ethane (C_2) and propane (C_3) gas, pressure decaying curve is obtained and analyzed through several apparatus. Diffusivity of C_1, C_2 and C_3 gas will be calculated by Fickian diffusion model. Diffusion selectivity and sorption selectivity will be calculated based on the data.