The Effect of Various Reaction Parameters in the Formation of Newly Synthesized Hybrid MOF-177/MWCNT

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Metal-organic frameworks (MOFs) have been extensively developed as a future technology for hydrogen storage. Many attempts have been made to prepare MOF with high hydrogen storage capacity. In the present work, metal organic framework MOF-177 was hybridized with multi-walled carbon nanotubes (MWCNT) that has been functionalized with carboxylic acid. The hybrid MOF-177/MWCNT (denoted as MOF-177C) has been synthesized by one-pot solvothermal process via two different routes: static and dynamic condition. It was found that dynamic condition was favorable to synthesized homogenous phase of MOF-177C crystals. The effect of various synthesis parameters such as reaction time, reaction temperature and concentration of MWCNT on the MOF-177C properties have been closely examined. By optimizing reaction parameters, the MOF-177C crystal obtained has BET and Langmuir surface areas of 5438.72 and 7207.13 m2/g, respectively. Low pressure hydrogen adsorption isotherm of the MOF-177C at 77K and 1 bar showed hydrogen uptake up to 1.99 wt% at 0.99 bar (740 mmHg), which is higher than the uptake of pure MOF-177 in the same condition.