

The shaping of Metal-Organic Frameworks for Water Vapor Adsorption

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Abstract : Metal-organic frameworks (MOFs) have drawn scientists' attention for decades due to its high specific surface area, tunable pore size, and relatively low temperature for regeneration. Bearing with those mentioned properties, MOFs has been widely used in various applications, such as adsorption/separation and catalysis. However, the current challenge for practical use of MOFs is to effectively shape these crystalline powder material into controllable forms such as pellets, granules, and monoliths with sufficient mechanical and chemical stability, while maintaining the excellent properties of MOFs powders. Herein, we have successfully synthesized an Al-based MOF powder which exhibits a high water capacity at relatively low humidity conditions and relatively low temperature for regeneration. Then the synthesized Al-MOF was shaped into granules with particle size of 2-4 mm by (1) tumbling granulation, (2) High shear mixing granulation, and (3) Extrusion techniques. Finally, the water vapor adsorption rate and crush strength of Al-MOF granules by different shaping techniques were measured and compared.

Keywords : granulation, granules, metal-organic frameworks, water vapor adsorption

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