RAPID FABRICATION OF UIO-66 USING A MICROWAVE-ASSISTED APPROACH AND ITS PERFORMANCE IN HYDROGEN STORAGE

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Abstract

This study presents a rapid and efficient microwave-assisted synthesis method for the synthesis of the zirconium-based metal-organic framework UiO-66, employing acetic acid as a modulating agent. X-ray diffraction (XRD) analysis confirms the successful formation of pure and crystalline UiO-66 material, with diffraction patterns matching those reported in the literature and showing no signs of structural impurities. Scanning electron microscopy (SEM) images reveal that the materials consist of small, irregularly shaped agglomerated nanoparticles. Energy-dispersive X-ray spectroscopy (EDX) analysis verifies the elemental composition of the framework, confirming the presence of zirconium (Zr), oxygen (O), and carbon (C), corresponding elements for UIO-66. The synthesized samples exhibit relatively high specific surface areas, with the maximum reaching 725 m^2/g, and display a mixed porosity profile comprising both micropores and mesopores. Despite a notable deficiency of organic linkers per Zr_6 unit, the materials maintain high thermal stability. A direct correlation was observed between the increase in total specific surface area and the enhancement of microporous surface area, which in turn led to improved hydrogen (H_2) adsorption performance.