

Modulated synthesis of chromium-based metalorganic framework (MIL-101) with enhanced hydrogen uptake

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Abstract

Modulated synthesis of MIL-101(Cr) in high yield and with good reproducibility using formic acid as a modulator is reported. Higher molar ratio of formic acid/CrCl₃ was found to form better shape-defined MIL-101(Cr) crystals with higher surface area, larger pore volume and better hydrogen uptake performance. The highly crystalline MIL-101(Cr), composed of crystals in the size range of 100e150 nm with multifaceted surface, could be obtained in an optimized molar regime of CrCl₃\$6H₂O/H₂BDC/100HCOOH/550H₂O at 210 °C for 8 h. The MIL-101(Cr) obtained from the modulated synthesis also showed high thermal and moisture stabilities as well as enhanced hydrogen storage capacity, making this material particularly promising for practical hydrogen storage applications.