

Studies on Thermodynamic Characteristics and Hydrogen Storage Performance of Metal Organic Frameworks

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Hydrogen storage materials play an important role in fuel cell vehicle. The metal organic frameworks (MOF) formed by linking metal ions with small organic multifunctional ligands are considered as one of promising candidates for hydrogen storage purpose in materials science. The MOF can also be used for magnetic exchange, non-linear optics, catalysis, etc. [1, 2]. In the present work, a series of metal organic frameworks (MOF) such as lead formate, lanthanum formate, zinc formate, manganese phthalate, $\text{LaCu}_6(\mu\text{-OH})_3(\text{Gly})_6\text{im}_6](\text{ClO}_4)_6$ [where Gly = glycine and im = imidazole], were synthesized. The materials were characterized by elemental analysis and infrared spectra. The crystal structures were determined by the single crystal X-ray diffraction. Thermal analysis based on TG and DSC was used for measurement of thermal behaviors. Furthermore, calorimetric study for lead formate was performed. The low-temperature heat capacity of lead formate was measured by a precise automated adiabatic calorimeter over the temperature rang from 80 to 380 K [3,4]. No thermal anomaly or phase transition was observed in this temperature range. A four-step sequential thermal decomposition mechanism for the lead formate was found through the DSC and TG-DTG techniques at the temperature rang from 500 to 635 K. In addition, the hydrogen storage properties for these compounds were determined by pressure-composition-isotherms (P-C-T) [5-6]. The relationship between hydrogen storage properties and composition of materials is under study.

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