〈 Waste-PET-derived BHET for rapid solvent-free MOF synthesis

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Abstract

Metal-organic frameworks (MOFs) are a class of porous materials that have recently attracted much attention owing to their remarkable yet tunable properties and enormous applications. Herein, we describe that the glycolysis product of polyethylene terephthalate (PET), *i.e.*, bis(2-hydroxyethyl) terephthalate (BHET), can be used as a linker source for the rapid solvent-free synthesis of UiO-66(Zr) through the grind and bake technique. We found that the hydrolysis of BHET to terephthalic acid (BDC) by proton produced from the hydrolysis and clustering of Zr precursor was the key to the crystal growth of UiO-66(Zr). Surprisingly, the use of H_2BDC, which is a typical linker source for UiO-66(Zr), resulted in no and poor diffraction patterns of UiO-66(Zr) when $ZrCl_4$ and $ZrOCl_2•8H_2O$, respectively, were used as Zr precursors. In this work, UiO-66(Zr) can be synthesized within 30 min (at 130 °C), which is much shorter than any previously reported grind and bake synthesis of UiO-66(Zr). Some MOFs, namely UiO-66(Hf), Cu-BDC, and MIL-53(Al), also have been successfully synthesized. This work realizes the idea of PET waste-to-MOFs with milder conditions, more convenience, and green compared to any solvent approaches.

Keywords: Grind and bake, metal-organic frameworks, UiO-66(Zr), polyethylene terephthalate, bis(2-hydroxyethyl) terephthalate.

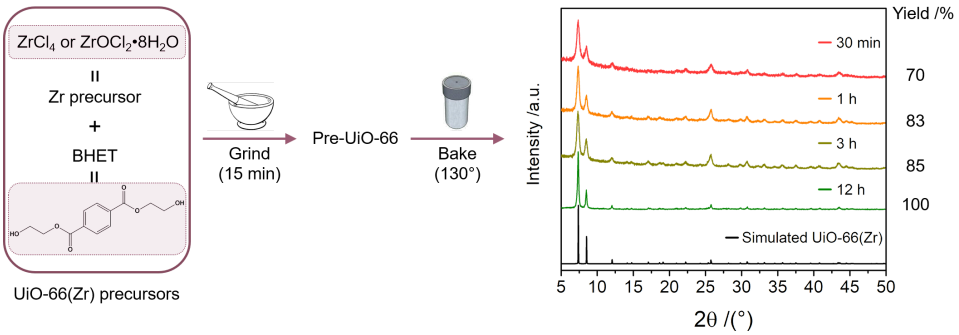

Figure 1. Illustration for the grind and bake synthesis of UiO-66(Zr) with BHET as a linker source along with the XRD patterns of the as-synthesized UiO-66(Zr) at different times and under 130 °C.

Reference

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