Supporting Information for

Shape-Selected Colloidal MOF Crystals for Aqueous Use

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Experimental procedures

All reagents and chemicals were obtained from Aldrich and used as received unless otherwise noted. DI water, DMF, toluene, and THF used were HPLC grade. Al₁₂O(OH)₁₈(H₂O)₃(Al₂(OH)₄)[btc]₆·24H₂O, MIL-96(Al) particles were synthesized as 375 of $Al(NO_3)_3 \cdot 9H_2O$ follows: Separately, mg and 210 mg of 1,3,5-benzenetricarboxylic acid (btc) were dissolved in 4:1 ratio of water to DMF mixture (4.43 mL total) with 2 h sonication. Acetic acid (0.57 mL) was then added to the metal solution and vortexed for 10 s before mixed to the ligand solution. The resulting mixture was heated at 130 °C for 24 h. Truncated hexagonal bipyramid (THBP) particles were collected by multiple purification cycles with MeOH and DMF at 0.45 wt % concentration. The particles were vacuum dried at room temperature before storing. Similarly, rounded THBP particles were synthesized by changing the water:DMF ratio to 1:1. Hexagonal bipyramid (HBP) particles were synthesized with 4:1 ratio of water:toluene mixture and spindle shaped particles were obtained with 4:1 ratio of water: THF mixture. HPLC grade THF solvents were used immediately to avoid the formation of peroxides.

Characterization methods

Scanning electron microscopy (SEM) measurements were performed using a Hitachi S-4800 field emission microscope at an accelerating voltage of 10 kV. The samples (5 µL, 0.45 wt%) were dried on Si wafers and then coated with Au/Pd before SEM observation. The particles are dispersed in DMF (0.05 wt%) and evaporated slowly to form a loose packing on the silicon wafer. The larger truncated hexagonal bipyramidal particles (Figure 3a, top) aligned along the c direction while the spindle like particles (Figure 3b) aligned along the elongated part. A higher concentration of particles (0.1)wt%) was used to align the truncated hexagonal bypiramidal (Figure 3a, bottom) along its trapezoid facets. Atomic force microscopy (AFM) images were acquired using an Asylum Research MFP-3D AFM system under ambient conditions in tapping mode with a standard 300 kHz silicon tapping tip (BudgetSensors, radius 10nm). Thermal gravimetric analysis (TGA) measurements were performed using a Perkin Elmer TGA7 system under N_2 gas flow with a heating rate 10 °C/min. X-ray powder diffraction analysis was performed using a Siemens-Bruker D5000 system with CuK α radiation. Out-of-plane X-ray diffraction (XRD) data were collected on a Philips X'pert MRD system in parallel beam configuration with Cu K α source in point focus. The particles were diluted and deposited on Si wafers then dried in air. Sample alignment and peak optimization were carried out by using reflection from Si (001).



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