

Supporting information

Upconversion luminescent humidity sensors based on lanthanide-doped MOFs

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Chemicals.

$\text{Er}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ (99.9%), $\text{Yb}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ (99.9%), and $\text{Y}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$ (99.9%) were obtained from Sigma-Aldrich Co., Ltd. Ethanol ($\text{C}_2\text{H}_6\text{O}$, 99.7%), 1,3,5-benzenetricarboxylate (BTC, 98%), LiCl (AR), MgCl_2 (AR), $\text{Mg}(\text{NO}_3)_2$ (AR), NaCl (AR), KCl (AR), KNO_3 (AR) and N,N-Dimethylformamide (DMF) were purchased from Sinopharm Chemical Reagent Co. Ltd. All chemicals and materials were purchased from commercial sources. Deionized water was used throughout the experiment.

Characterization.

The scanning electron microscopy (SEM) measurements were performed on a SUPRA-55 scanning electron microscopy equipped with an energy dispersive spectrometer (EDS) of Oxford-AztecX-Max80. LnMOF dispersed in ethanol and dripped onto the copper grids by pipettes to characterize transmission electron microscopy (TEM). The TEM measurements were performed on a JEM-2100F low-to-high resolution transmission electron microscopy operated with an acceleration voltage of 120 kV. Fourier transform infrared spectroscopy (FTIR) spectra were recorded by an Avatar 370 instrument with KBr pellet tableting (spectral ranging from 4000 to 400 cm^{-1}). Powder X-ray diffraction (XRD) characterization was carried out by an 18kW D/MAX2500 PC diffractometer with a scanning speed of $8^\circ \cdot \text{min}^{-1}$ from 10° to 90° using a Cu $\text{K}\alpha$ radiation (60 kV, 80 mA). Upconversion luminescence spectra were obtained on an Edinburgh FS-5 fluorescence spectrometer equipped with a continuous wave 980 nm laser. UV-vis absorption spectra were recorded with a Shimadzu UV-2501pc UV-Vis absorption spectrophotometer.

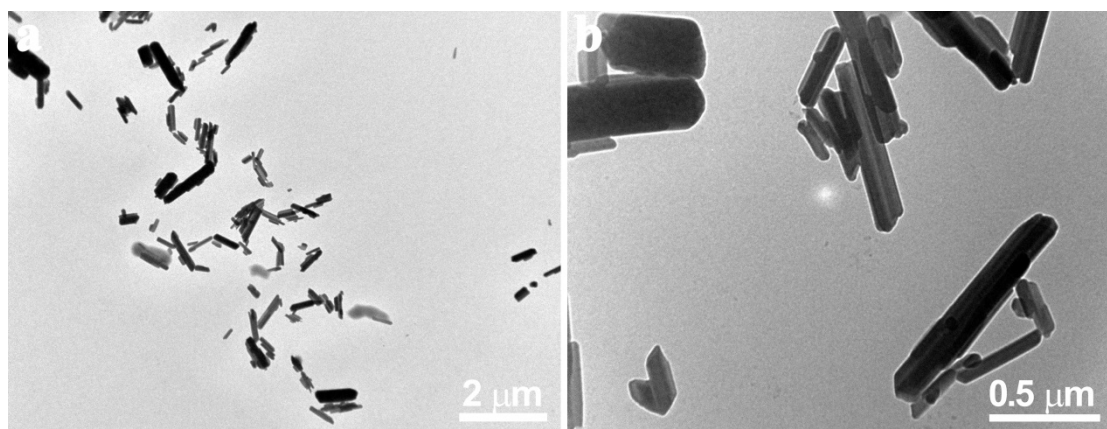


Figure S1. Transmission electron microscopy (TEM) images of Y/Yb/Er-MOF with different magnifications.

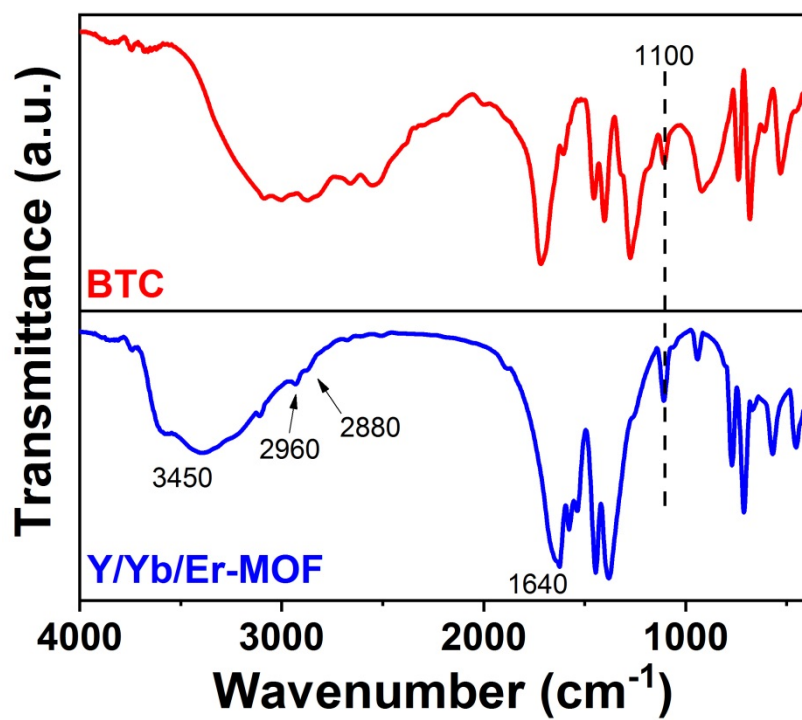


Figure S2. Fourier transform infrared spectroscopy (FTIR) spectra of Y/Yb/Er-MOF and BTC.

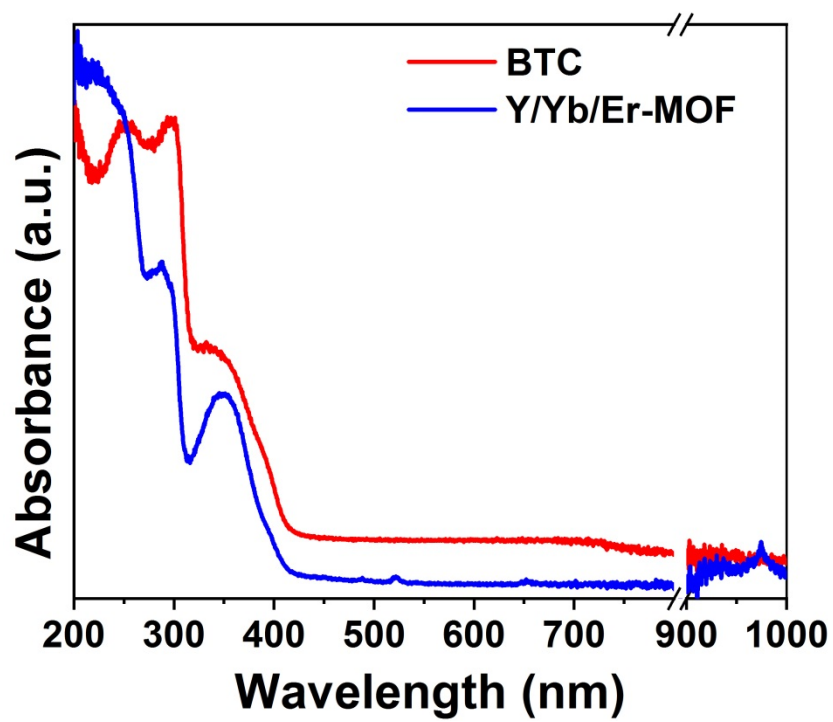


Figure S3. The UV-visible absorption spectra of Y/Yb/Er-MOF and BTC.