



Supplementary Materials

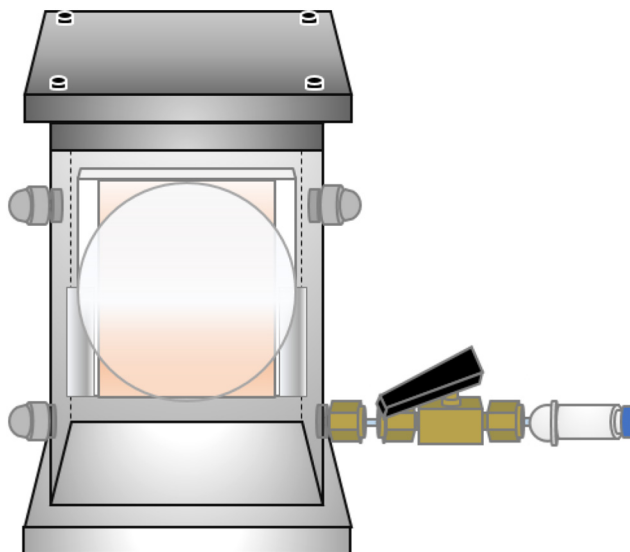


Fig. S1. Schematic of the gas-reactor used in this study.

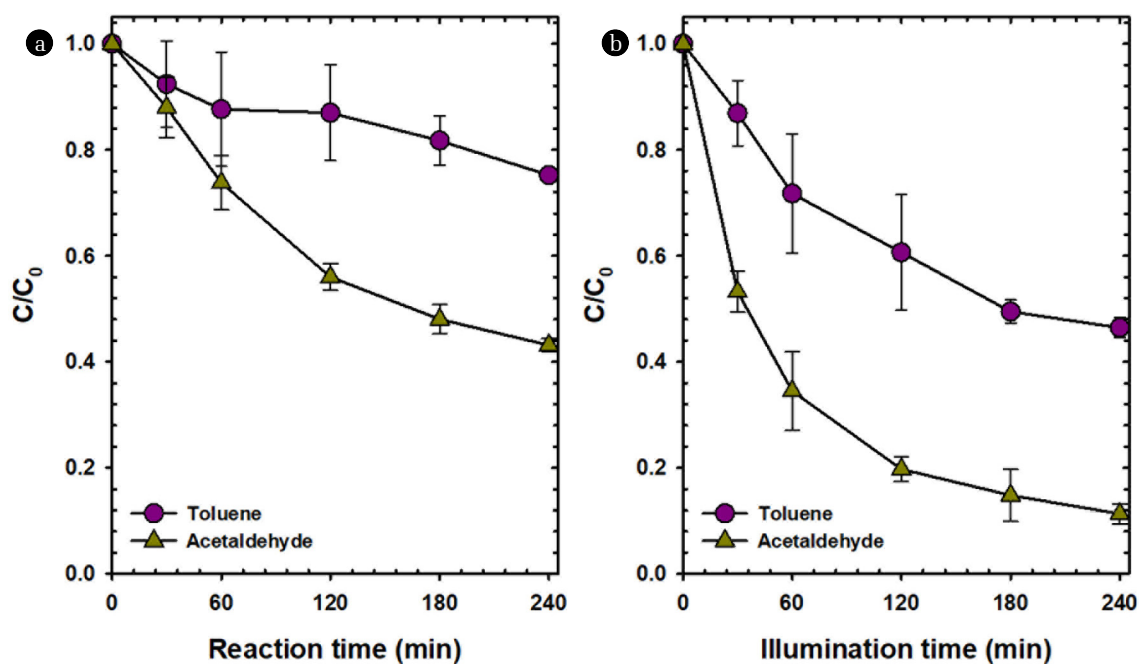


Fig. S2. Comparison of toluene and acetaldehyde removal under (a) dark, and (b) illuminated conditions ($[Toluene]_0 = [Acetaldehyde]_0 = 3.59 \text{ mg/L}$; $[Catalyst]_0 = 0.15 \text{ g/mL}$).

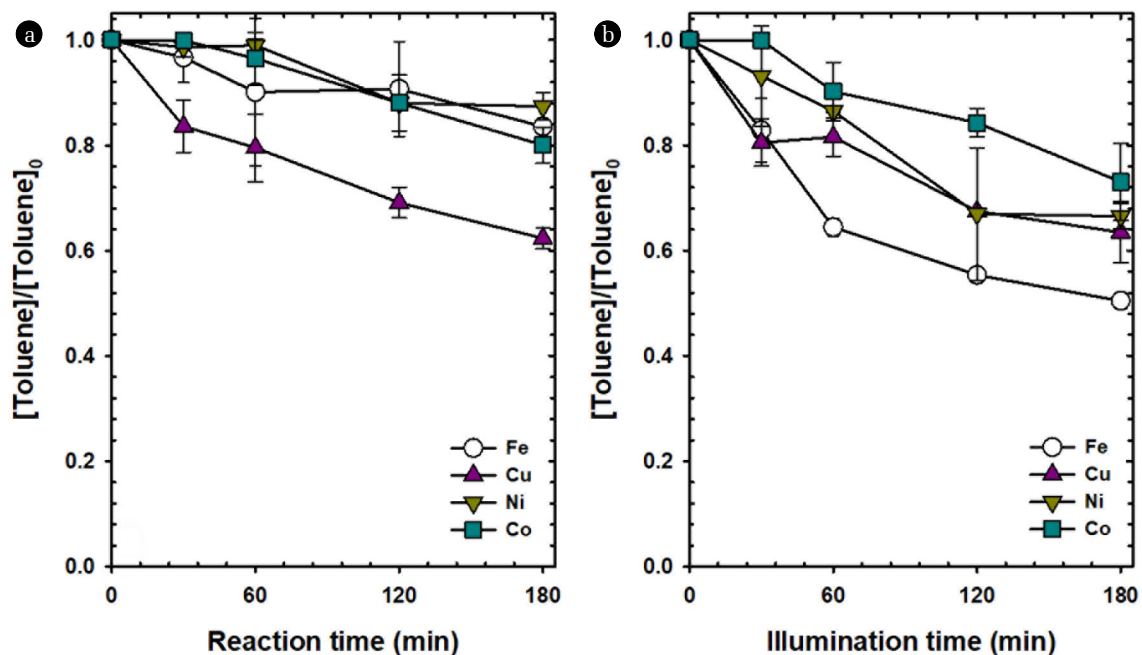


Fig. S3. Removal of toluene by MIL-53(X) under (a) dark, and (b) illuminated conditions (X = Fe, Cu, Ni, Co) ($[\text{Toluene}]_0 = 3.59 \text{ mg/L}$; $[\text{Catalyst}]_0 = 0.15 \text{ g/mL}$).

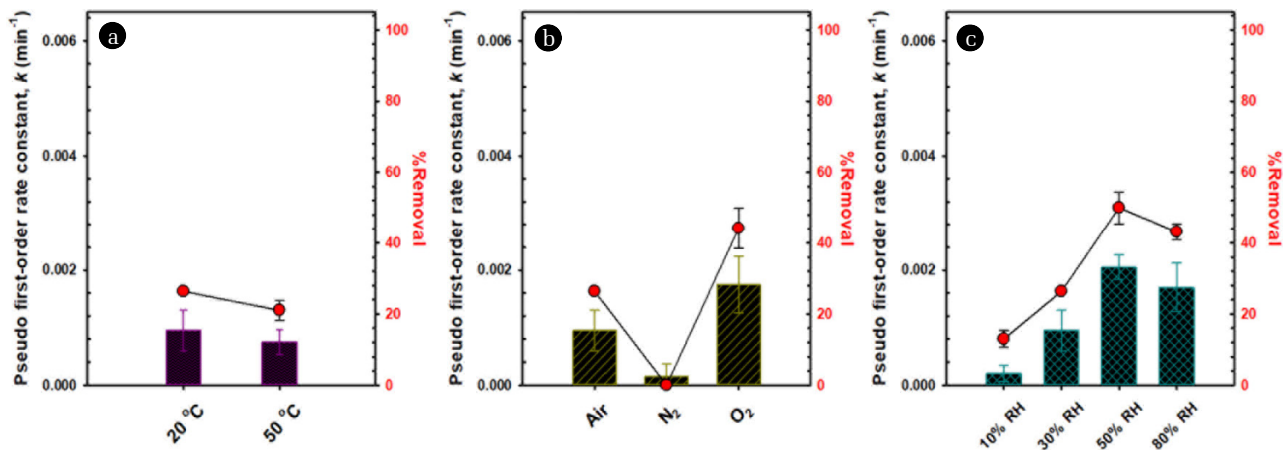


Fig. S4. Effects of (a) temperature, (b) atmospheric condition, and (c) relative humidity on the removal of toluene in dark ($[\text{Toluene}]_0 = 3.59 \text{ mg/L}$; $[\text{Catalyst}]_0 = 0.15 \text{ g/mL}$).

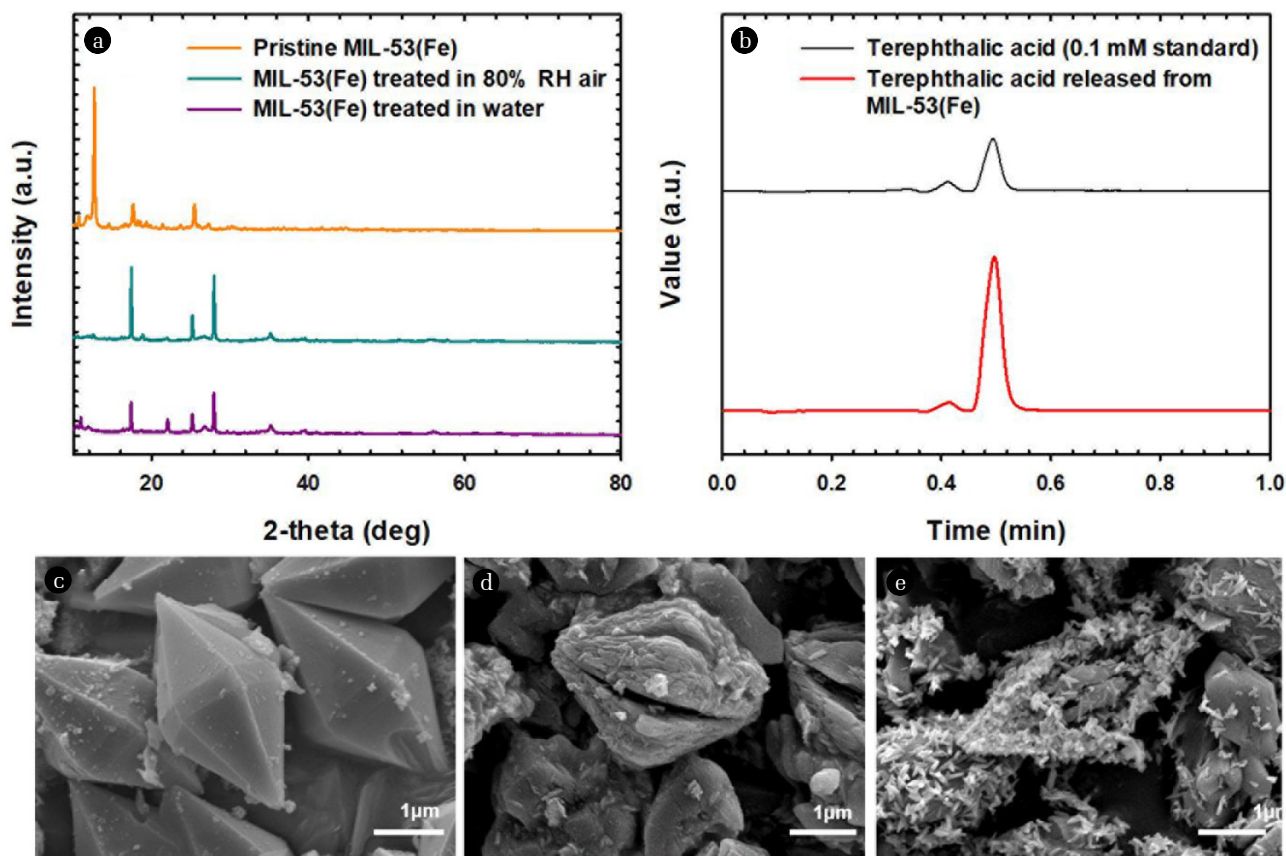


Fig. S5. Spectra of (a) XRD for treated MIL-53(Fe) materials, (b) HPLC spectrum of released terephthalic acid, and SEM images of the (c) pristine, and (d) & (e) treated MIL-53(Fe) materials (treated in 80% RH air (d), and in water for 2 h (e)).

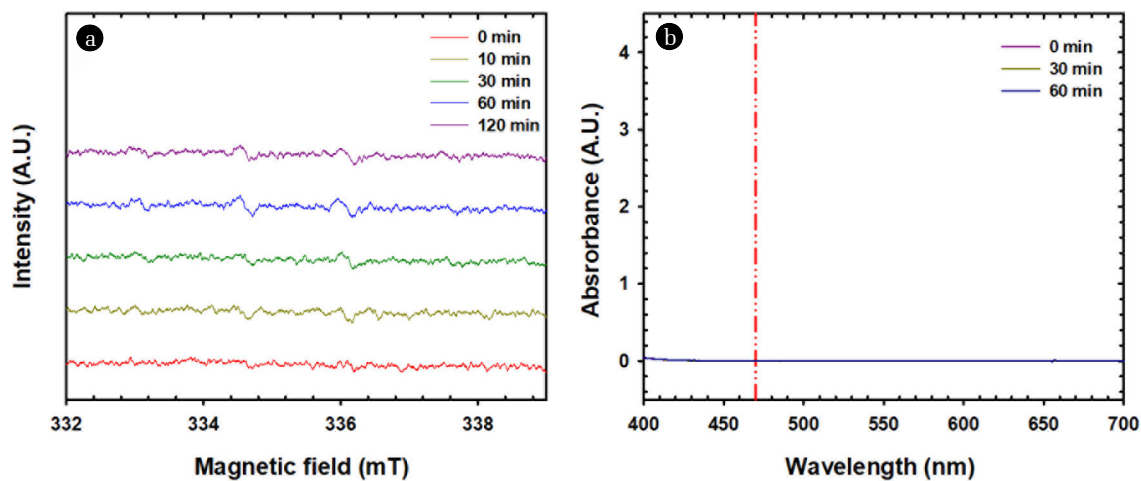


Fig. S6. Spectra of (a) EPR and (b) spectrophotometric XTT assay, in the presence of MIL-53(Fe) under illumination ($[\text{Catalyst}]_0 = 0.15 \text{ g/mL}$; Xenon lamp = 150 W ($\lambda > 400 \text{ nm}$; 100 mW/cm^2); $[\text{DMPO}]_0 = 10 \text{ mM}$ for (a); $[\text{XTT}]_0 = 0.1 \text{ mM}$ for (b)).

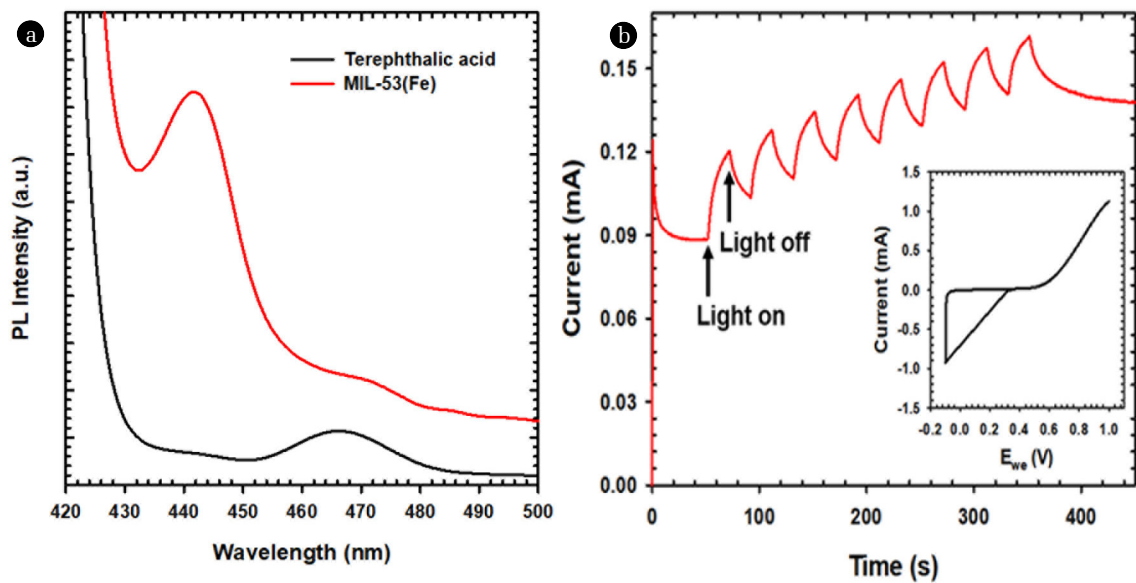


Fig. S7. (a) PL spectrum and (b) transient photocurrent response of MIL-53(Fe) (inset: linear sweep voltammogram of MIL-53(Fe) with visible light illumination) (light on/off cycle is 20 s for (b)).