Supporting Information

Facile Generation of Carbon Quantum Dots in MIL-53(Fe) Particles as Localized Electron Acceptors for Enhancing Their Photocatalytic Cr(VI) Reduction

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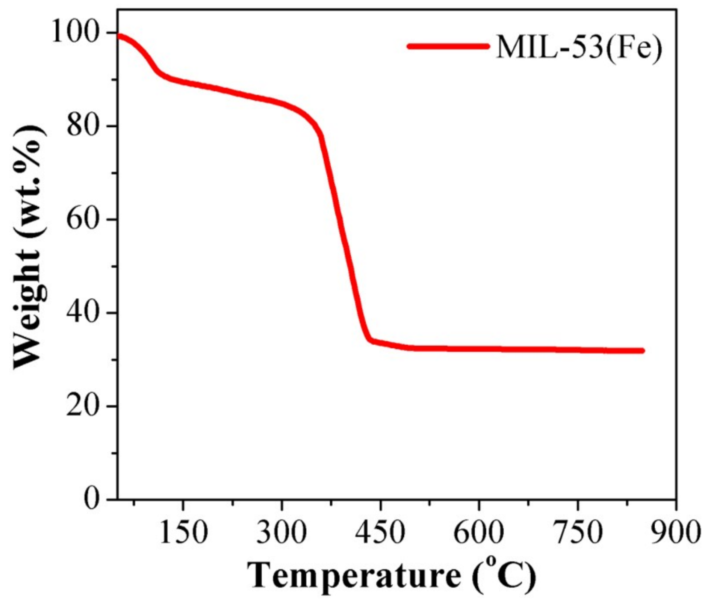


Fig. S1. Thermogravimetric curve of the prepared MIL-53(Fe) particles. The initial weight loss at 100 °C is from the absorbed water and the loss at 350 °C is from the carbonization of BDC linkers in the MOF. This data suggests that the MOF particles are very stable at 200 °C during the carbonization of glucose at this temperature.

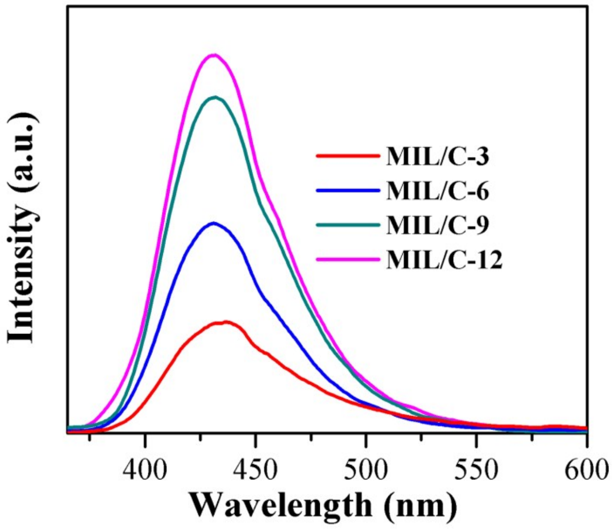


Fig. S2. PL emissions of CQDs after the dissolution of MIL-53(Fe)/CQDs composites prepared with different amount of glucose (λ_{ex} = 370 nm). The increase in PL intensity indicates that more and more CQDs will be formed inside the MIL-53(Fe) particles as the increase in loading amount of glucose.

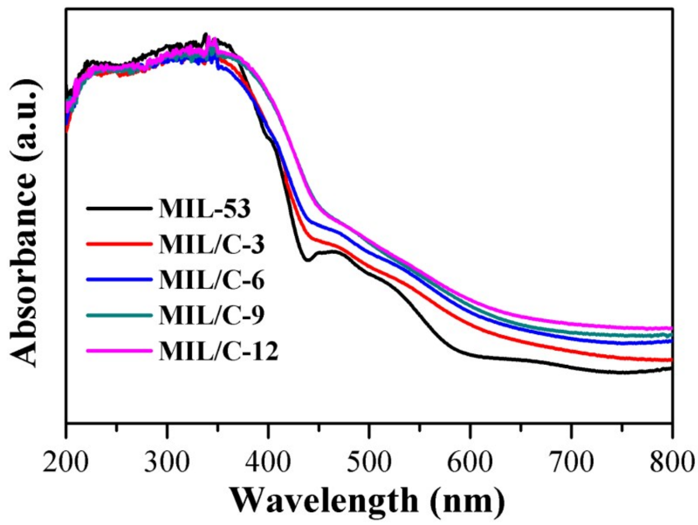


Fig. S3. UV-visible spectra of MIL-53(Fe)/CQDs prepared with different amount of glucose. It is evident that the generation of CQDs inside the MOF particles can increase their visible absorption in the visible region.

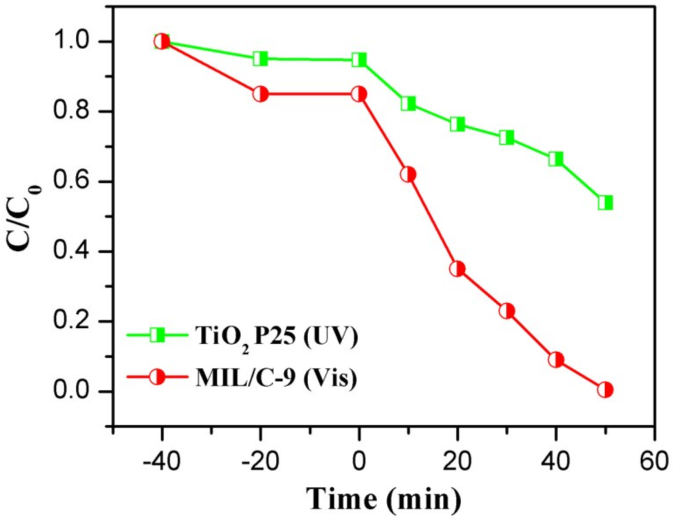


Fig. S4. Comparison of photocatalytic activities of MIL/C-9 sample under visible light irradiation (>420 nm) and TiO_2 P25 under UV irradiation (300-400 nm). The composite exhibits obviously better activity than the benchmark catalyst P25 for Cr(VI) reduction.

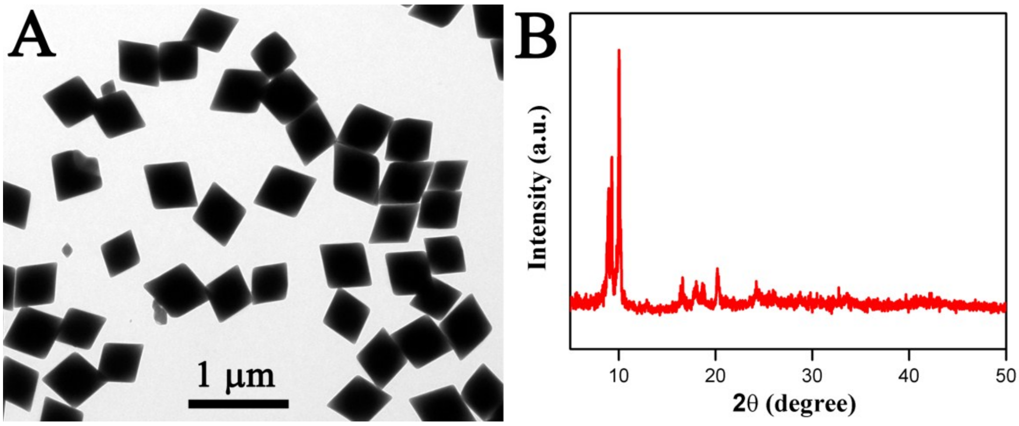


Fig. S5. (A) TEM image and (B) XRD patterns of MIL-53(Fe)/CQDs composite after photocatalytic Cr(VI) reduction experiment. The morphology and phase of sample keep unchanged after the catalytic reaction, showing good stability of the composite catalyst.

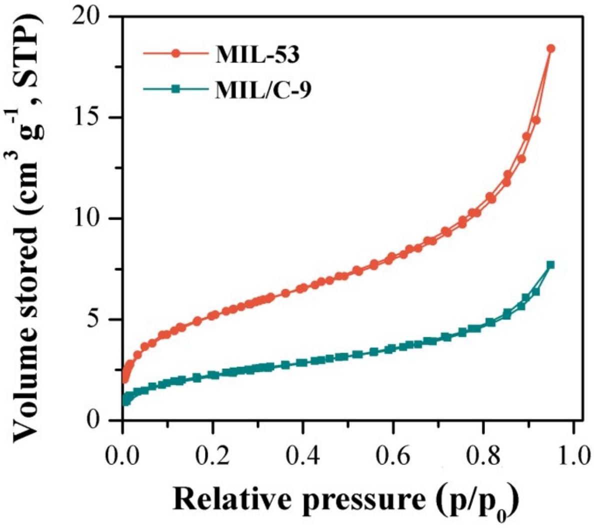
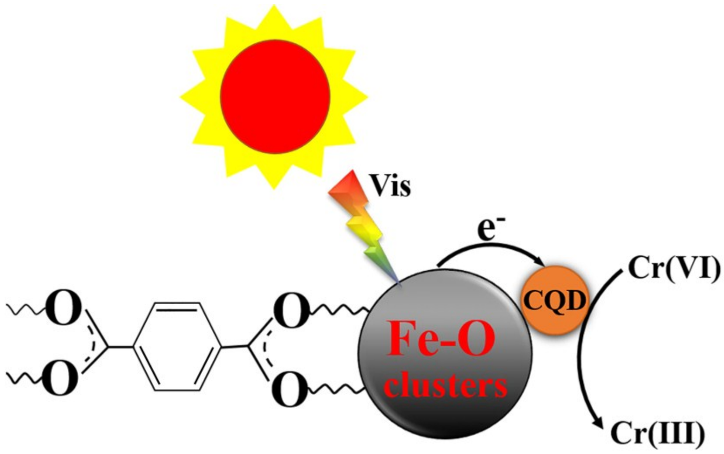
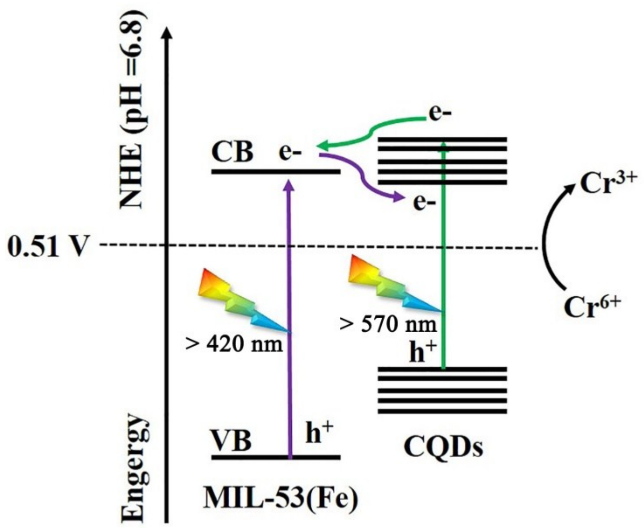


Fig. S6. N_2 adsorption-desorption isotherms of MIL-53(Fe) and MIL-53(Fe)/CQDs at 77 K. After generation of CQDs, BET surface area of the MOF particles become decreased, showing that many CQDs have possess the pore vacancies in the MOF particles.



Scheme S1. Schematic illustration of the heterojunction structure between Fe-O cluster and CQD inside MIL-53(Fe) and their electron transfer route under visible light irradiation.



Scheme S2. Schematic illustration of electron transfer process under different irradiation band. Under visible light irradiation > 420 nm, the electrons are generated from MIL-53(Fe) and subsequently transfers from the CB band of MIL-53(Fe) to the CB band of CQD (as electron receptor) for Cr(VI) reduction. This is the main reaction mechanism of MIL-53(Fe)/CQDs composite. Under long visible light irradiation >570 nm, the CQDs can also harvest some visible light and generated hot electrons in high energy levels, working as photosensitizers. These electrons will first inject to the CB band of MIL-53(Fe) and then transfer to the lower energy levels of CQDs, due to the high electron conductivity of carbon materials. The photosensitization effect of CQDs only contributes in part to the catalytic activity of MIL-53(Fe)/CQDs, playing a secondary function (see Fig. 6C).