Electronic Supplementary Material (ESI) for CrystEngComm

Supporting Information

Controllable synthesis of $Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$ as a highly efficient heterogeneous Fenton-like catalysts

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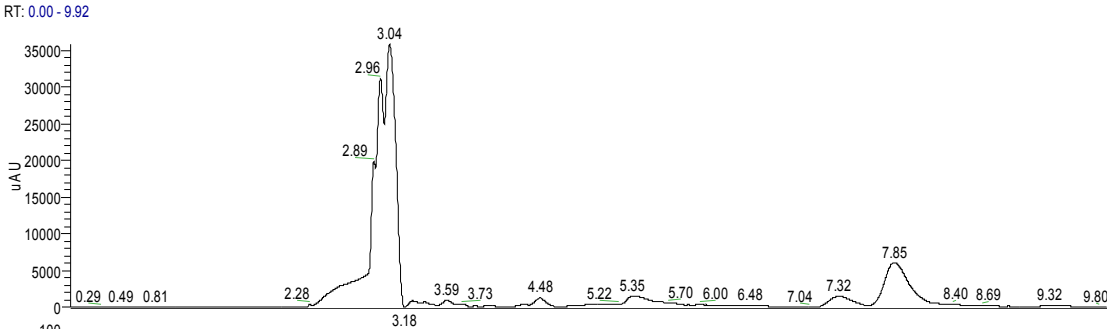
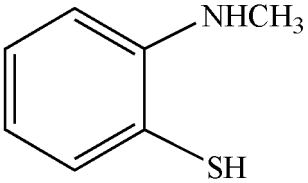
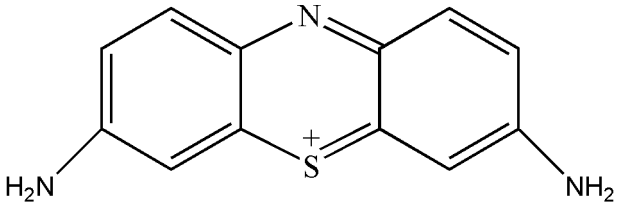
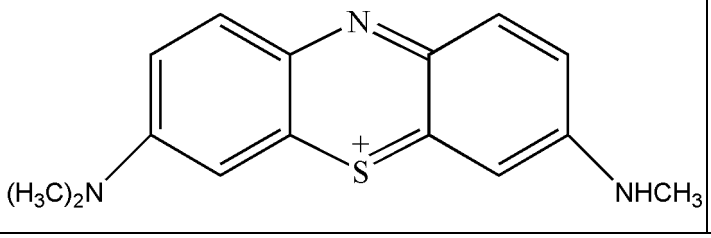


Figure 1. Chromatograms of MB [$Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$: 0.5 g L^{-1}; H_2O_2: 9.8 mM; MB: 1×10^{-5} M] degradation products irradiated for 6h in methanol–water (35:65, v/v) eluent.

Table 1
Suggested structures for the intermediates based on LC–MS results.

Retention time, t_R (min)	Structural formula	Molecular weight
3.04		139
5.35		228
7.85		269

Ultraviolet light was obtained by a 12 W Hg lamp (λ= 254 nm, the Institute of Electric Light Sources, Beijing) and the average light intensity was 1 mW cm^{-2}. The radiant flux was measured with a power meter (the Institute of Electric Light Sources, Beijing). The average light intensity of solar light was 40 mW cm^{-2}. The radiant flux was measured with a power meter (the Institute of Electric Light Sources, Beijing).

Both the result of reaction carried out using UV source and solar light were shown in Fig. 2. The photodegradation reaction under solar light was far more than UV light. Photosensitization principle promoted degradation, and the reaction mechanism was shown in Scheme 1.

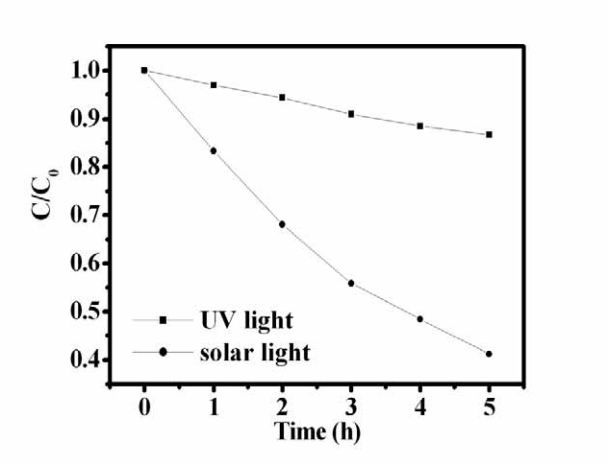
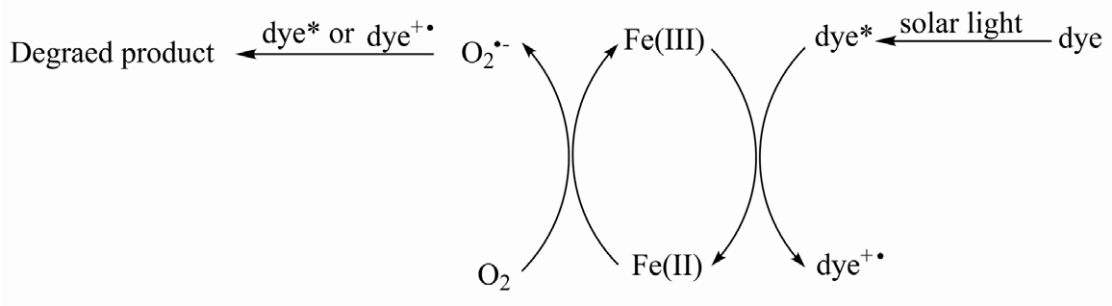


Fig. 2 Photocatalytic degradation of MB by $Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$ under different light source irradiation.



Scheme 1 The mechanism of photodegradation reaction under solar light.

The extent of mineralization of MB was examined by determination of residual total organic carbon (TOC). Temporal changes of TOC during the photodegradation process of MB were depicted in Fig. 3. The TOC in the solution displayed limited and

slow decrease during the irradiation period.

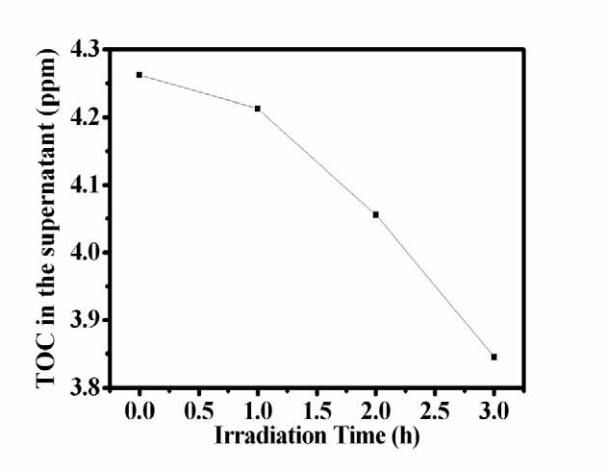


Fig. 3 Temporal changes in total organic carbon (TOC) in the degraded bulk solution during the photodegradation of MB process.

$Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$ as a kind of heterogeneous photocatalyst could be easily recycled by a simple filtration. After three recycles for the photodegradation of MB, the catalyst did not exhibit any significant loss of activity, as shown in Fig. 4.

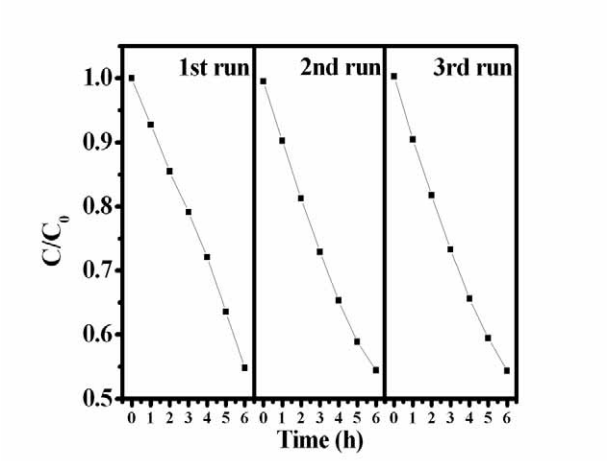


Fig. 4 Cycling runs in the photocatalytic degradation of MB in the presence of $Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$ under visible light irradiation; $Fe_5(PO_4)_4(OH)_3 \cdot 2H_2O$ loading, 0.5 g L^{-1}; initial concentration of MB, 10^{-5} M; λ>420 nm.