Electronic Supplementary Material (ESI) for Catalysis Science & Technology.


# Supplementary Information

## Fabrication of black $TiO_{2-x}/CuFe_2O_4$ decorated on diatomaceous earth with enhanced sonocatalytic activity for ibuprofen mitigation

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**Text S1 the adsorption capacity investigation**

The IBP solutions with different concentrations were prepared in order to evaluate the maximum adsorption capacity of catalyst sample under dark. The solution was initially mixed with fixed amount of catalyst. When the adsorption/desorption equilibrium was achieved under dark condition, the concentration of IBP solution was measured, and the corresponding adsorption capacity was calculated by the following equation:

$$Q_e = \frac{V(C_0 - C_e)}{M} \quad (1)$$

In the equation, $Q_e$ represents the adsorption capacity at equilibrium (mg/g), $C_0$ represents the concentration of IBP solution before mixed with catalyst (mg/L), $C_e$ represents the concentration of IBP solution at equilibrium (mg/L), $V$ represents the volume of IBP solution (L), and $M$ represents the mass of catalyst (g). The adsorption capacity curve of sonocatalyst is displayed in Fig. S1, which implies that when the initial concentration of IBP solution increased, the adsorption capacity also increased. Besides, among various samples, $TiO_{2-x}/CuFe_2O_4$/DE showed the highest adsorption capacity.

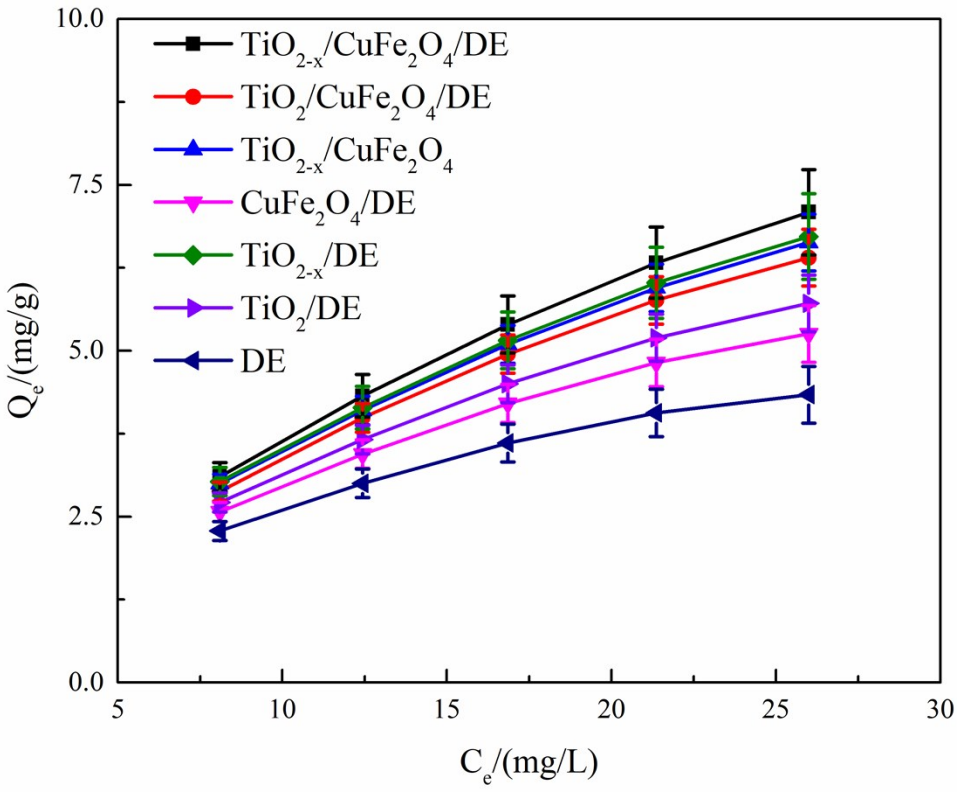


**Fig. S1.** The adsorption capacity of sonocatalyst.

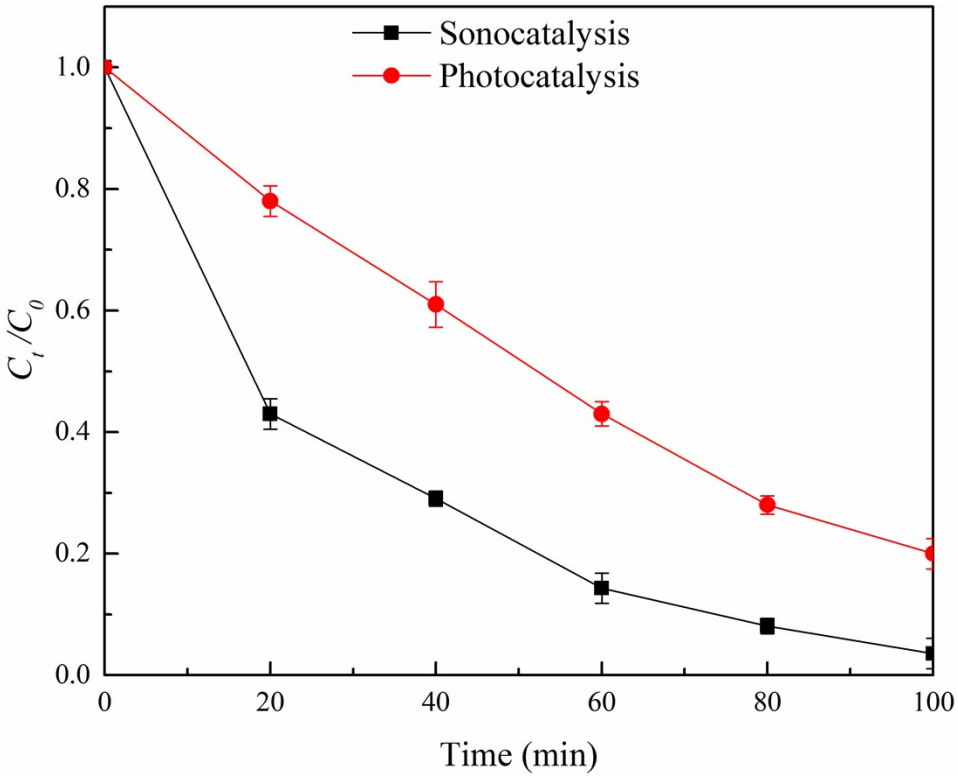


**Fig. S2** The comparison between photocatalysis and sonocatalysis using $TiO_{2-x}/CuFe_2O_4$/DE.

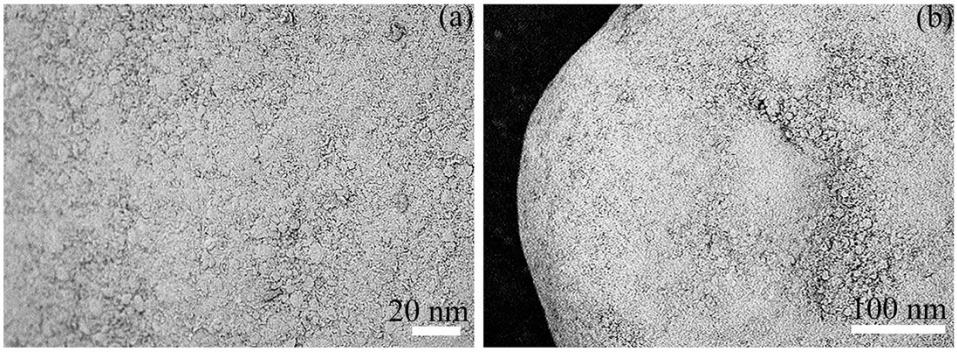


**Fig. S3.** The morphology comparison of polystyrene particles ($1.4*10^7$ P/cm$^3$) before and after sonocatalytic test.

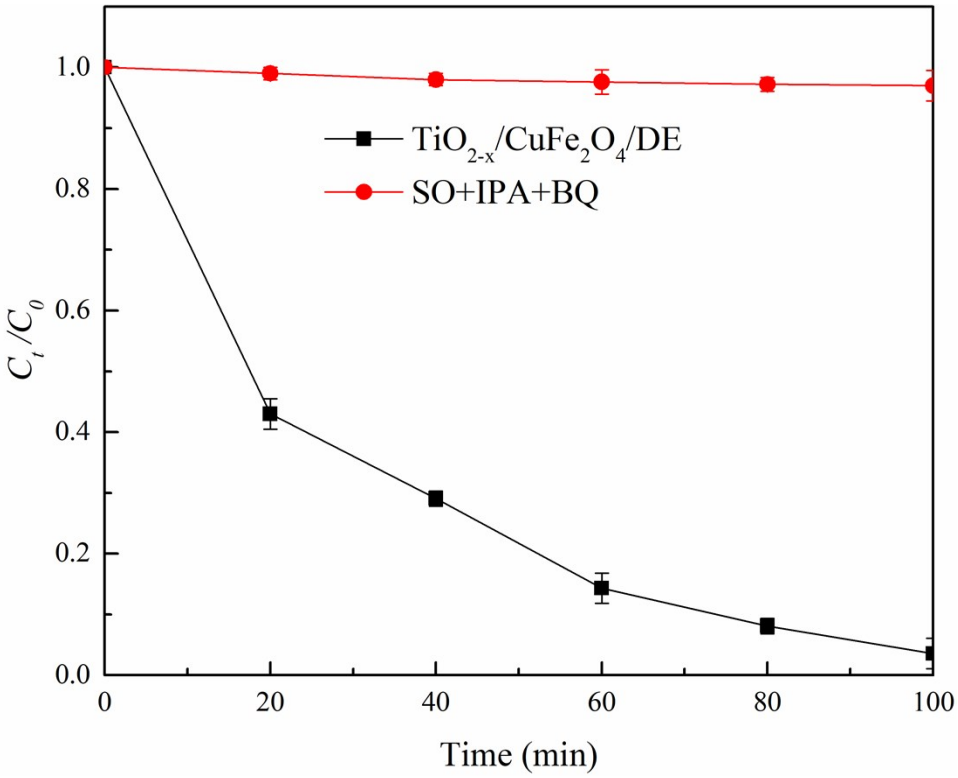


**Fig. S4.** The quenching test results with $TiO_{2-x}/CuFe_2O_4/DE$ using all three quenchers (AO+IPA+BQ).

**Table S1** Removal percentage and kinetic data of IBP sono-oxidation tests using different catalysts

| Catalyst samples | Removal efficiency (RE%) | $k$ ($10^{-3}$ $min^{-1}$) | $R^2$ |
|---|---|---|---|
| $TiO_{2-x}/CuFe_2O_4/DE$ | 96.4 | 42.2 | 0.9923 |
| $TiO_2/CuFe_2O_4/DE$ | 81.0 | 20.8 | 0.9947 |
| $TiO_{2-x}/CuFe_2O_4$ | 91.3 | 31.7 | 0.9941 |
| $CuFe_2O_4/DE$ | 69.0 | 14.4 | 0.9962 |
| $TiO_{2-x}/DE$ | 85.0 | 24.7 | 0.9940 |
| $TiO_2/DE$ | 60.3 | 10.7 | 0.9956 |
| DE | 53.0 | 9.02 | 0.995 |
| IBP self-degradation | 18.6 | 1.92 | 0.9977 |