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## Catalytic degradation of tetracycline hydrochloride by persulfate activated with nano Fe<sup>0</sup> immobilized mesoporous carbon

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### Abstract

In this study, mesoporous carbon (MC) supported nano Fe<sup>0</sup> was prepared from polyvinyl alcohol (PVA) using MnCO<sub>3</sub> as template, which was used as the catalyst to activate persulfate (PS) for the removal of tetracycline hydrochloride (TC) from aqueous solution. The nano Fe<sup>0</sup> was immobilized on MC by liquid phase reduction to overcome the drawbacks of nano Fe<sup>0</sup> for persulfate (PS) activation, including being easily aggregated and oxidized. The experimental results showed that the nano Fe<sup>0</sup>/MC+PS system achieved 92.1% of TC removal, while the MC+PS system and nano Fe<sup>0</sup>+PS systems showed 78.5% and 33.7% of TC removal, respectively. High removal efficiency in the nano Fe<sup>0</sup>/MC+PS system could be attributed to the superior PS activation capability due to the synergistic effects of nano Fe<sup>0</sup> and MC. In order to better understand the removal mechanism, the effects of nano Fe<sup>0</sup> loading amount (*c*), dosage (*m*), PS/TC mole ratio (*R<sub>m</sub>*) and initial pH on TC removal were evaluated in the nano Fe<sup>0</sup>/MC+PS system. The results showed that the removal efficiency of TC was enhanced with the increase of nano Fe<sup>0</sup> loading amount and dosage, while slightly decrease with the increase of PS/TC mole ratio. The maximum removal of TC was 97.7% under the optimal conditions: *c*=20%, *m*=0.8 g/L, *R<sub>m</sub>*=50/1 and pH=5. According to the results of radical scavengers' studies and intermediates analysis, SO<sub>4</sub><sup>•-</sup>, which was produced from catalytic activation of PS by nano Fe<sup>0</sup> and Fe<sup>2+</sup> on

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