Magnetic $SnFe_2O_4$ nanoparticles: synthesis and their application for visible light photocatalyst for chlortetracycline

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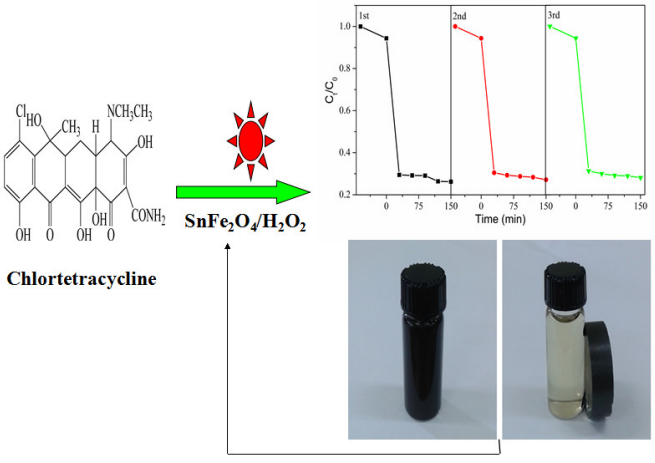
Due to their moderate bandgap energy and magnetization, spinel ferrite nanomaterials such as $CoFe_2O_4$, $ZnFe_2O_4$, $MnFe_2O_4$, and $NiFe_2O_4$ have recently raised increased research interest for their applications in magnetically retrievable photocatalyst[1-4]. Considering the advantages such as environmental friendliness and abundant element storage, we attempted in preparing $SnFe_2O_4$ nanoparticles and studied their magnetic properties. Highly crystalline $SnFe_2O_4$ nanoparticles with high saturation magnetization were prepared in alkaline solutions containing $SnCl_2$ and $FeCl_2 \cdot 4H_2O$ with NaOH and NH_4OH by a one-pot solvothermal method at 200℃. The technique requires neither long time high temperature calcination nor any other supplementary reagents during the preparation process. The structural, optical, morphology, and magnetic properties were investigated by XRD, FT-IR, PL, HRSEM, HRTEM, XPS, and VSM. The results showed that $SnFe_2O_4$ nanoparticles have the crystallite size in 40-50nm with a high saturation magnetization of 74.3 emu/g, which is much higher than the reported values for $SnFe_2O_4$ nanoparticles prepared using precipitation exchange[5,6]. The photocatalytic experiments showed that the $SnFe_2O_4$ nanoparticles can effectively degrade chlortetracycline with the assistance of H_2O_2 under the visible light radiation, and can maintain a stable performance with continuous recycled usages. Our results demonstrated that that $SnFe_2O_4$ can be a potential photocatalyst for removing the organic pollutions in environment water.

Keywords: olvothermal, $SnFe_2O_4$, saturation magnetization, degradation, chlortetracycline



Highly crystalline $SnFe_2O_4$ nanoparticles with high saturation magnetization and superior chlortetracycline degradation efficiency was developed using a one-pot solvothermal method.

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