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Quick and enhanced degradation of bisphenol A by activation of potassium peroxymonosulfate to $\text{SO}_4^{\bullet-}$ with Mn-doped BiFeO_3 nanoparticles as a heterogeneous Fenton-like catalyst

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Abstract

Mn-doped BiFeO_3 magnetic nanoparticles (BFO MNPs), namely $\text{BiFe}_{1-x}\text{Mn}_x\text{O}_3$ ($x = 0.05$ and 0.10), were successfully synthesized using a simple and novel sol-gel method and then applied as a highly efficient peroxymonosulfate (KHSO_5 , PMS) activation catalyst for the fast degradation of bisphenol A (BPA) from aqueous solution. The strong PMS activation ability of 10 % Mn-doped BFO MNPs without any metal leaching due to the simultaneous effects of iron and manganese ions in the production of radical sulfate ($\text{SO}_4^{\bullet-}$), caused complete BPA degradation in 15 min, which was much faster than that using combinations with H_2O_2 . TOC was reduced to 33 %, 23 % and 13 % by PMS activated with BFO, 5 and 10 % Mn doped BFO, respectively, which are 2.1, 2.6 and 3.15-fold lower than that same nanoparticles activated with H_2O_2 . The photocatalytic mechanism of BPA with the simultaneous effects of iron and manganese ions in Mn-doped BFO was explored. The addition of KBrO_3 and NaNO_3 salts into Mn-doped BFO/PMS system reduced the complete BPA degradation time to 10 min, whereas

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