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Intensive adsorption and degradation of environmental hormone micro-contaminated water by a new g-C_3N_4 based composite photocatalyst coupled modified mesoscopic carbon

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ABSTRACT

Despite low exposure level in the water, environmental hormone pollutants can still inflict significant biological effects that endanger ecological safety and human reproduction. However, they are unable to be effectively removed using ordinary water treatment methods, which makes the deposition of environmental residues highly likely. In light of this demand, this study synthesized metal-doped g-C_3N_4 composite photocatalysts and coupled them with nitrogen doped ordered mesoporous (NMC) carbon to treat water contaminated by environmental hormone micropollutants. The experimental results show that $AgIn_5S_8$/g-C_3N_4 (25%) makes the prime candidate for degrading bisphenol A (BPA), displaying the highest degradation rates of 82%. Moreover, h^+ and·O^{2-} were found to be the main active substances in the photocatalytic process, while the degradation rate of BPA by $AgIn_5S_8$/g-C_3N_4 (25%) was still over 80% after 5 repeated photocatalyses. When the nitrogen doped ordered mesoporous carbon was coupled with $AgIn_5S_8$/g-C_3N_4 (25%), the degradation and removal rates of BPA were greatly improved, demonstrating up to 94.8% removal rate in batch treatment. Furthermore, NMC/$AgIn_5S_8$/g-C_3N_4 also exhibited good adsorption–photocatalytic synergy under continuous flow conditions of the fluidized bed, and the highest removal rate of BPA in the dark-free adsorption experiment was about 98.1%.

Keywords: Graphitic carbon nitride; Modified mesoporous carbon; Environmental hormone; Adsorption; Photocatalysis

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