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MIL-88b(Fe)-MOF Grafted Carbon Dot Nanocomposites as Effective Photocatalysts for Fenton-Like Photodegradation of Amphotericin B and Naproxen Under Visible Light Irradiation

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Abstract : The synthesis of a photocatalytic adsorbent involved the integration of carbon dots (CD) into a metal-organic framework (MOF) of MIL-88B(Fe) using the solvothermal technique. Characterization of the resulting CD@MIL-88B(Fe) was conducted using various analytical methods, including X-ray-based microscopic and spectroscopic techniques, electrochemical impedance spectroscopy, UV–Vis, FT-IR, DRS, TGA, and photoluminescence (PL) analysis. The adsorbent demonstrated significant photocatalytic activity, achieving up to 92% and 90% removal of amphotericin B (AmB) and naproxen (Nap) from aqueous solutions under visible light, with an RSD value of around 5%. The study explored the factors influencing the degradation of pharmaceuticals and determined the optimal conditions for the process, including pH values of 3 and 4 for AmB and Nap, a photocatalyst concentration of 0.2 g L-1, and an H2O2 concentration ranging from 40 to 50 mM. Reactive oxidative species such as ·OH and ·O2 were identified through the examination of different scavengers. Additionally, the adsorption isotherm and kinetic studies revealed that the synthesized photocatalyst functions as an effective adsorbent, with maximum adsorption capacities of 42.5 and 121.5 mg g-1 for AmB and Nap, while also serving as a photocatalytic agent for removal purposes.

Keywords : fenton-like degradation, metal-organic frameworks, heterogenous photocatalysts, naproxen
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