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Functionalized Microbial Consortia with Silver-Doped Hydroxyapatite (Ag@HAp) Nanostructures for Removal of RO84 from Industrial Effluent

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Abstract: Considering that freshwater is a necessity for human life, sewage treatment has been a serious concern for an increasing number of scientists and academics in recent years. To clean industrial effluents, innovative catalysts with good adsorption, chemical stability, and physicochemical properties have been constructed. Here, a prospective microbial consortium was extracted from the wastewater and used as a low-cost catalyst that was functionalized with silver and silver-doped hydroxyapatite (Ag@HAp) nanostructures made using a sonochemical approach. The structural, optical, and crystal phases of Ag and Ag-doped hydroxyapatite (Ag@HAp) nanostructures were studied using ultraviolet-visible (UV-Vis), Fourier transfer infrared spectroscopy (FTIR), X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), and high-resolution transmission electron microscopy (HRTEM) techniques. The degradation action of functionalized microbial consortia was examined against reactive orange 84 (RO84) organic discharge. Excellent efficiency for the removal of industrial effluents was found for the Ag NPs and Ag-doped hydroxyapatite (Ag@HAp) loaded with microbial consortia. A maximum of 95% of the decolorization properties of the RO84 dye were obtained in the case of microbial consortia with Ag and Ag@HAp, which was better than the consortia alone (80.32% for 5 ppm and 69.54% for 20 ppm). The consortia/Ag showed 93.34% for 5 ppm and 85.43% for 20 ppm, while was higher for consortia/Ag@HAp (95.34 and 88.43%). The use of these surface-modified nanocatalysts for wastewater treatment and waste effluents discharged from laboratories, the chemical industry, and other sources could be expanded.

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