A High-Performance Wastewater Treatment System for Orange II Degradation Using a Boron-doped Diamond Electrode and Enhanced by Zeolite-TiO₂ Photocatalyst

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A wastewater treatment system has been studied which is composed of an electrochemical cell and a photocatalysis unit. A boron-doped diamond (BDD) electrode and TiO₂-loaded zeolite (zeolite-TiO₂) were used in the electro-photo process, and the joint treatment efficiency was assessed Orange II degradation. The photo-electro treatment of Orange II in aqueous solution was monitored using a combination of HPLC and UV-visible absorption spectroscopy methods. Zeolite improves the photo-efficiency of titanium dioxide due to synergistic effects of the improved generation of active radicals (S₂O₈²⁻ and OH^{*}). Orange II underwent a further rapid degradation by the introduction of zeolite-TiO₂ due to strong adsorption and space effects. The degradation activity to Orange II follows the decreasing order: BDD-zeolite-TiO₂ > BDD > zeolite-TiO₂. The degradation rate was seen to increase with OH^{*} radicals resulted from S₂O₈²⁻ which produced on the BDD surface and by the zeolite-TiO₂ catalyst. Orange II could be almost completely degraded to CO₂ and H₂O after 180 min of electrolysis time by this joint treatment system.

Keywords: boron-doped diamond; zeolite-TiO₂; Orange II; photo-electro degradation

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