Degradation of Malachite Green by Visible Light-Assisted Electrocatalytic Treatment Using N-V co-doped TiO₂ as Photocatalyst

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A γ -Al₂O₃-supported N-V co-doped TiO₂ (N-V/TiO₂/ γ -Al₂O₃) photocatalyst was prepared as a particle electrode for a visible light-assisted multiphase electrocatalytic treatment. In this experiment, the Na₂SO₄ concentration, aeration, voltage and pH are used as variables, and COD removal is the response for multivariate optimization. The optimal condition for maximizing the COD removal of malachite green was obtained as Na₂SO₄ concentration of 0.12 mol/L, Voltage of 10.35V, Aeration of 51.9L/h and pH of 4. The optimal predicted and experimental COD removal were 86.94% and 86.17%. To study the intermediates and final products of malachite green degradation and further study the photoelectrochemical degradation pathway of malachite green, the solutions were sampled and pretreated for GC-MS analysis. A possible photoelectrochemical degradation pathway of MG were speculated. The visible light-assisted multiphase electrocatalytic method had a remarkable effect on the degradation of the simulated malachite green wastewater, and the operation was simple. By further optimizing the reaction conditions, it could be applied to the practice of malachite green removal in wastewater treatment engineering.

Keywords: electrocatalysis; visible light; photoelectrocatalysis; malachite green; intermediate product

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