

Chemosphere

Photocatalytic degradation of nevirapine with a heterostructure of few-layer black phosphorus coupled with niobium (V) oxide nanoflowers (FL-BP@Nb₂O₅)

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Abstract

The degradation and removal of antiviral drugs in water has emerged remains a major challenge. This work presents, the photodegradation of nevirapine (NVP) with a novel p-n heterostructure of FL-BP@Nb₂O₅ nanoparticles synthesized via hydrothermal method. Several characterization techniques revealed a successful formation of the heterostructure with well aligned band positions that promoted excellent separation of charge carriers. A systematic study was conducted on the effect of initial pH, initial catalyst loading and initial concentration on the degradation kinetics of NVP. Degradation efficiency of 68% was achieved with the FL-BP@Nb₂O₅ after 3 h with 5 ppm initial concentration solution of NVP, at a working pH of 3 and 15 mg of photocatalyst. The stable fragment resulting from the degradation of NVP was n-butanol as evidenced by LC/MS. The successful degradation of NVP transpired with synergistic effect exhibited by the heterostructure that led to accelerated formation of reactive species that were responsible for the breaking down of NVP into smaller fragments. A TOC removal percentage of 19.03% after the photodegradation of NVP was observed, suggesting a successful break down of NVP to simpler non-toxic carbon-containing compounds.