



Photocatalytic degradation of *p*-nitrotoluene (PNT) using TiO₂-modified silver-exchanged NaY zeolite: kinetic study and identification of mineralization pathway

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ABSTRACT

Nitroaromatic compounds are suspected hormone disrupter and considered as toxic priority pollutants. In the present study, different amounts of titanium dioxide impregnated zeolite Y (Si/Al ratio 5.5) was modified by silver metal ion exchange and its photocatalytic activity was studied for the mineralization of *p*-nitrotoluene (PNT) in aqueous medium. The synthesized catalysts were characterized by XRD, SEM, inductively coupled plasma, diffuse reflectance spectroscopy, and N₂ adsorption techniques. The analysis of degradation intermediates and mineralization pathways were established using high performance liquid chromatography and mass spectroscopy. The mineralization of PNT into final products: CO₂, H₂O, NO₃⁻, and NH₄⁺ was assessed by chemical oxygen demand (COD) analysis. Langmuir–Hinshelwood kinetic model was proposed for the degradation and the reaction rate constant values were determined from the experimental data using the model. TiO₂ loading was optimized from the percentage degradation, rate constant, and mineralization values. COD study reveals up to ~60% mineralization in 240 min of irradiation to 75 mg L⁻¹ PNT with TiO₂/AgY2 catalyst.

Keywords: Photocatalysis; Mineralization; Degradation; *p*-nitrotoluene; COD; Zeolite

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