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RELATIONSHIP BETWEEN STRUCTURE OF SOME NITROAROMATIC POLLUTANTS AND THEIR DEGRADATION KINETIC PARAMETERS IN UV-VIS./TiO_2 SYSTEM

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Abstract. The degradation of dinitrobenzene (DNB) and dinitrotoluene (DNT) from aqueous solution under UV-vis. irradiation using heavy metal (0.5 wt.% Fe, 1 wt.% Co, 1 wt.% Ni)-doped titania was investigated. Dopant type, structure and initial pollutant concentration influence on the degradation efficiency were evaluated in order to set up the optimal working conditions which assure substrate advanced degradation. The kinetics of nitroaromatics degradation and organic nitrogen mineralisation was assessed and pseudo-first order rate constants were calculated. Fe doped photocatalyst with lowest metal content (0.5 wt.%) showed a considerable better behaviour in respect to pollutant degradation than Co and Ni (1 wt.%)-doped titania catalysts. Degradation rate constant was higher for DNT than DNB, due to the presence of alkyl group substituted to aromatic ring in the case of toluene derivative. This has a determinative effect on pollutant adsorption on catalyst surface and degradation pathway. For highest pollutant concentration tested (3×10^{-4} M), optimum working conditions (0.5 wt.% Fe-doped – TiO_2 loading of 200 mg/l, pH 7 and 240 min irradiation time) assure advanced nitroaromatics degradation ($\eta_{DNB} = 89\%$, $\eta_{DNT} = 94\%$) and organic nitrogen mineralisation ($\eta_{DNB} = 44\%$, $\eta_{DNT} = 47\%$).

Keywords: nitroaromatic compounds, photocatalysis, heavy metal doped TiO_2, kinetic parameters.

AIMS AND BACKGROUND

Hazardous organic compounds like nitroaromatics are frequently found in chemical and petroleum industries discharged effluents. Due to their bio-refractory character[1] and high chemical stability can not be efficiently removed by classical biological

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