
Photodegradation of some phenyl urea herbicides in water: mineralization and intermediates

Ilie SIMINICEANU^a, Maria Magdalena BOBU^a and Elsa LUNDANES^b

^a*Technical University "Gh.Asachi" of Iași, Bd. Mangeron 71, Iași 700050, Romania*

^b*University of Oslo, Department of Chemistry, N-315 Oslo, PO Box 1033, Norway*

Abstract The paper presents new experimental results on the photodegradation of two important phenyl urea herbicides in water: Monuron and Isoproturon. The photodegradation was performed by four Advanced Oxidation Processes (AOP): UV/H₂O₂, UV/TiO₂, UV/H₂O₂/ Fe(II), UV/H₂O₂/ TiO₂. The initial concentration of the Monuron aqueous solution was of 2×10^{-4} mol/L while that of Isoproturon of 5×10^{-5} mol/L, both proportional to their solubilities in water. The concentrations of unreacted substrates and of some intermediates were determined by HPLC analysis. The Total Organic Carbon (TOC) measurements have been performed with a TOC Shimadzu analyser model TOC 5000A. The optimal parameters have been identified for each system (substrate/ process). The main conclusion from the results is that the most effective process, for both substrates, is the photo-Fenton. Using doses of 10 mmol/L H₂O₂ and 1 mmol/L Fe(II) the Monuron was almost completely removed after only 15 minutes, while TOC was reduced by 73.88 % after 60 minutes of irradiation. With doses of 0.5 mmol/L H₂O₂ and 0.05 mmol/L Fe(II) the Isoproturon was also completely removed after 15 minutes, and TOC was reduced by 88.78% after 60 minutes of irradiation. The second practical conclusion is that Monuron is more resistant to mineralization than Isoproturon by AOP processes.

Keywords: Monuron, Isoproturon, photoreactor, AOP comparison, water treatment
