Identification of Oxidation By-Products of Picloram

Ali Özcan¹, Yücel Şahin¹, and Mehmet A. Oturan²

¹ Anadolu University, Faculty of Science, Department of Chemistry, 26470, Eskişehir, Turkey, aozcan3@anadolu.edu.tr
² Université Paris-Est, Laboratoire Géomatériaux et Géologie de l'Ingénieur, 5 bd Descartes, Mame la Vallée Cedex 2, France

Picloram (4-amino-3,5,6-trichloro-2-pyridincarboxylic acid) is a herbicide used for broadleaf weed control in pasture and rangeland, wheat, barley, oats, and for woody plant species [1]. It is highly persistent in the soil environment, with reported field half-lives from 20 to 300 days and an estimated average of 90 days [2]. Photodegradation is significant only on the soil surface and volatilization is practically nil. It is soluble in water, and therefore may be mobile. These properties, combined with its persistence, mean it might constitute a risk of groundwater contamination. That concern has generated many recent research efforts such as developing advanced oxidation processes (AOPs) to remediate the presence of such kind of substances in water. These processes based on the generation of highly reactive species such as hydroxyl radicals (‘OH) [3,4]. Many intermediate species are formed during the reaction between organics and ‘OH in these systems. The identification of the formed intermediates has great importance in respect to environment and technical aspect.

In this study, we used some chromatographic and mass spectrometric techniques in order to identify the degradation intermediates of picloram formed during the electro-Fenton treatment [5]. High performance liquid chromatography (HPLC), gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS) were used in the determination of the aromatic intermediates. The derivatization process was also employed for the GC-MS analysis. The formed short chain carboxylic acids and inorganic ions were determined by HPLC and ion chromatography (IC), respectively.

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References