Proceedings of the 8th International Conference on Environmental Science and Technology
Lemnos Island, Greece, 8 – 10 September 2003
Full paper Vol. A, pp. 154 - 161

TRIFLURALIN PHOTOLYSIS: COMPARATIVE RATES OF HUMIC AND FULVIC SUBSTANCES (ISOLATED FROM PAMVOTIS LAKE) AND PHOTOPRODUCTS ANALYSIS

A.D. DIMOU, V.A. SAKKAS and T.A. ALBANIS

Laboratory of Industrial Chemistry, Department of Chemistry, University of Ioannina, Ioannina 45110, Greece
E-mail: talbanis@cc.uoi.gr

EXTENDED ABSTRACT

Pesticides are invaluable inputs for increased agricultural production. However improper usage of pesticides by farmers leads to environmental contamination.
Various transport and transformation processes (such as hydrolysis and biodegradation) determine the environmental fate of pesticides. Among them, solar irradiation can initiate important transformation pathways in the atmosphere as well as at the soil and water surfaces via direct and indirect processes. In view of the importance of pesticide stability in the agro-ecosystem, the kinetics of a selective, pre-emergence, herbicide representative of a growing list of N-substituted 2,6-dinitroanilines (trifluralin) widely used in weed control, is studied here, taking under examination the effect of dissolved organic matter.
The present study deals with the determination of the degradation kinetics of trifluralin in aqueous solutions containing humic (HA) and fulvic (FA) acids isolated from natural water (Pamvotis lake). The procedure that has been followed for the isolation of humic and fulvic substances, utilizes adsorption chromatography followed by size-exclusion chromatography, hydrogen saturation by ion exchange, and lypholization to obtain low-ash aqueous humic substances. The preparative concentration of organic substances (HA and FA) is done by multiple re-concentration procedures. Soon after the isolation procedure the humic and fulvic portions obtained were used in the photolysis experiments under simulated solar irradiation (Suntest apparatus) in 4 different concentrations in order to study their effect on the reaction rate.
It is well known that the fate and degradation of organic micropollutants are largely affected by the presence of organic matter like the humic and fulvic materials we are dealing with here. These substances are widespread in water-soil environment systems and strongly adsorb light leading to the formation of reactive oxygen intermediates. They can either enhance or inhibit the rate of photolysis of organic micropollutants.
On the basis of the dissipation data, the half-lives were calculated by using the regression analysis and the rate constant *k* was calculated from the first-order rate equation. In addition an SPE procedure has been applied combined with GC-MS for the determination of the possible photo-degradation products.

Key words: trifluralin, isolation, humic acids, fulvic acids, photolysis , organic matter