

UV PHOTOLYSIS STUDIES OF 3-NITROFLUORANTHENE BY HPLC, GCMS, AND EPR TECHNIQUES

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Abstract: Polycyclic Aromatic Hydrocarbons (PAHs) are produced during the combustion of fossil fuels in modern society and also by natural processes, such as volcanic activities and forest fires. These compounds are decomposed by sunlight in the environment and produce different derivatives. Substituted PAHs are more toxic due to the ability of the substituent to transfer energy to biological systems when in an excited state more easily than their non-substituted counterparts. Generally these compounds and their metabolites possess carcinogenic and mutagenic properties. However, the photo degradation mechanisms and their products have not been well studied, for example 3-nitrofluoranthene (3-NFA). This compound is formed through atmospheric reactions of fluoranthene with nitrogen oxides; and during the combustion of fossil fuels that contain fluoranthene. The purpose of this research project is to study the degradation of 3-nitrofluoranthene (3-NFA) using UV-A light. First, 3.5 mL of 100 μ M 3-NFA in acetonitrile was irradiated for 8 hours with UV lamps. Photoproducts were analyzed by HPLC, GCMS and EPR techniques. Through a series of HPLC analysis, 3-NFA was observed at 12.23 min initially, and was not detected after 8 hours irradiation. Major peaks observed after 8 hours irradiation are 1.71, 2.44, 5.63, and 6.1 min. The photo degradation of 3-NFA follows first order kinetics, resulting in a rate constant of 0.28 hr^{-1} ; giving 3-NFA a photo degradation half-life of 2.45 hr. GC-MS analysis of 8 hours degradation determined two photoproducts whose masses included 217 and 236 m/z at elution times 22.48 min and 27.7 min respectively. Furthermore, radicalization of the parent molecule was characterized by EPR spectrometry in order to detect the active site of degradation and thus determine the proper mechanism pathway.

Keywords: Photochemistry, 3-Nitrofluoranthene, Photodegradation, Polycyclic Aromatic Hydrocarbons

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