Effect of Photodegradation on Dihydroxynaphthalene for Decomposition of Polyaromatic Hydrocarbons

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Polyaromatic hydrocarbons (PAHs) are common organic pollutants in water and well known for their persistence, carcinogenicity, mutagenicity, and toxicity. Motor oil from cars, insecticides, pesticides, and pharmaceuticals get into our water sources through run off and seepage and various other ways polluting our fresh water body. These PAHs are extremely toxic and exposure to them at minute concentrations can cause adverse effects on human health. Photosensitization method considered as an environmentally friendly method because it employs nontoxic and low cost photosensitizer, oxygen, and visible light to produce singlet oxygen species via a photosensitization reaction, which then instantly reacts with PAHs and photodegrades them into nontoxic carbon dioxide (CO_2) and water (H_2O) as final products. The primary purpose of this experiment is to explore if polycyclic aromatic hydrocarbon derivative, such as dihydroxynaphthalene (DHN), can be decomposed into water and carbon dioxide in an effort to reduce organic pollutants in water via photosensitization method. Our experimental data suggested that DHN photodegrade rapidly into an intermediate product Juglone, a nontoxic interim hydrocarbon when it (DHN) was treated with aqueous solution of cationic photosensitizer (TMPyP) under visible light irradiation. UV-Visible spectrometer and a Rayonet photoreactor were used for monitoring the progress of reaction and irradiating experimental sample with visible light, respectively. Our data leads us to conclude that photosensitization method, particularly singlet oxygenation method over a long period can be an effective method to photodegrade polyaromatic hydrocarbons into nontoxic products for water purification application.