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Photocatalytic degradation of anthracene using titanium dioxide

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The human population is suffering increased exposure to existing and new chemicals and environmental toxins. Among the various environmental toxins, PAHs are an important class of environmental contaminants, and many PAHs are known or suspected carcinogens. PAHs are produced in the environment through the incomplete burning of organic fuels and cover wide classes of compounds. Exposure to some of these compounds is well-known to cause cancer in mice and they are suspected to be carcinogenic compounds for humans. The photocatalytic degradation of anthracene in aqueous solutions in the presence of TiO₂ suspension has been investigated with the use of UV-irradiation. This study includes comparison between two types of titanium dioxide (P25 and UV100), also includes effect of different parameters on photocatalytic oxidation of anthracene by titanium dioxide were studied, such as: anthracene concentration, pH of aqueous solution, light intensity, addition of H₂O₂ and temperature on photocatalytic oxidation. The results showed that titanium dioxide, P25 type is better than UV100 type. The results also showed the optimum conditions for degradation process by photocatalytic oxidation are; perfect concentration of anthracene is 25 ppm, 6.8 of pH is the best value for anthracene, 2.5 mW. Cm⁻² of light intensity, degradation rate of anthracene without addition of hydrogen peroxide is fastest and 308.15K is the appropriate degree of temperature. The results indicated that the photocatalytic degradation of anthracene was well described by pseudo first order kinetics according to the Langmuir-Hinshelwood model. The effect of temperature on the efficiency of photodegradation of anthracene was also studied in the range 278.15-308.15 K. The activation energy was calculated according to Arrhenius plot, and was found equal to 12.76 kJ.mol⁻¹ for TiO₂ (Degussa P25). The main product of anthracene after degradation was 9, 10-anthraquinone which was identified by GC-MS. The intermediate compound that produced of degradation of anthracene was 9,10-anthraquinone. This product characterises by FTIR and GC-MS, the complete degradation for 9-10 anthraquinone was achieved.

Biography

Faiq F Karam has completed his BSc at the age 22 years from University of Basrah and MSc at the age of 34 years from University of Baghdad. He is joined as Lecturer and Researcher at University of Al-Qadisiya, College of Science since 2005. He is the Assistant of Head of environmental research unit for one year in College of Science. He is the Assistant of Head, Department of Chemistry for two years 2006-2008, a secretary of the faculty council for one year. He has published more than 10 papers in local and international journals.

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