E1-13: Mineralization of organic pollutants in Kandy Lake water by semiconductor photocatalysis

K Tennakone, I Kottegoda, C T K Thilakaratne,
K G U Wijayantha
(*Inst. of Fundamental Studies, Hantana Road, Kandy*)

TiO_2 is known to be an excellent photocatalyst for oxidative degradation of organic contaminants in water. Examples of compounds that could be destroyed by this process have been reported in the literature. For practical applications, it is essential to determine whether this method has the ability to mineralize and destroy a heterogeneous mixture of unidentified contaminants.

Samples of water from Kandy Lake were mixed with TiO_2 (100 mg l^{-1}) and exposed to sunlight (light intensity measured with an Eko Pyranometer). At different intervals of time COD value, NO_3^-, NH_4^+ were measured by standard methods. In another experiment, water from the same source subjected to photolysis in a photochemical reactor (400 W medium pressure mercury lamp) kept purged with oxygen and carbon dioxide in the out-going gas, was estimated by gas chromatography.

COD value was found to decrease progressively with continuation of irradiation with a concomitant increase in the NO_3^- concentration. There was no evidence for photoproduction of NO_2^- and NH_4^+. In the experiment with the photochemical reactor, CO_2 evolution was noted and the rate of CO_2 liberation decreased with the progress of photolysis.

The investigation shows that, even a heterogeneous mixture of organic contaminants in water can be oxidatively destroyed by semiconductor (TiO_2) based photocatalysis. However, the production of nitrate from oxidation of organic matter containing nitrogen is inevitable.