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Rajesh K. M.
Chemical pollutants are harmful substances for human beings and for the environment. Conventional methods of water and air decontamination, even if effective, are often chemically, energetically and operationally intensive and suitable only for large systems; moreover, the residuals coming from intensive chemical treatments can add to the problems of contamination. Research and development on various systems and technologies have extensively been performed worldwide to find solutions for energy and environmental problems. Among this, Photocatalysis by semiconducting materials, an advanced oxidation processes developed in recent decades, has proven to be a promising technology for environmental remediation.

Photocatalysis is the catalysis of a spontaneous chemical reaction where light is required for the catalyst to function. A photocatalyst can transform light energy into chemical energy by creating strong oxidative and reductive species which greatly enhance the rate of the spontaneous reaction. Studies related to photocatalysis have increased immensely over the past few years and currently well over 1000 research papers are published annually. Titanium dioxide (TiO₂) is usually the material of choice for photocatalytic applications because it has been frequently found to possess the best activity and stability when compared to other materials. Buts its activity limited to UV irradiation based on bandgap. Lot of modification is still progressing to attain visible light irradiation with very high photocatalytic activity.

During the last years the main goal of research on photocatalysis was to find the best photocatalyst. This was pursued by trial and error methods. In present study we prepare a modified titania with nonmetal through tried a trial and error method to attain its application in visible light region. The prepared
catalysts are characterized by various techniques and correlated it with its activity. The visible light performance of the prepared catalysts is evaluated by degradation of some aqueous dyes and organic pollutants, production hydrogen through water splitting reaction and an antibacterial study.

This thesis is entitled as “Studies on photocatalysis by nano titania modified with non-metals" based on experimental work carried out during the years 2007-2011 in the laboratory of Department of Applied Chemistry, Cochin University of Science and Technology.