Seminar

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Institute for Plasma Research

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Title: Solar photocatalytic dye degradation using Zn_2TiO_4 catalyst and LIBS study using Li_2TiO_3 pellet

Speaker: Dr. Rajashree Sahoo

Institute for Plasma Research, Gandhinagar

Date: 19th April 2023 (Wednesday)

Time: 10:30 AM

Venue: Join the talk online:

https://meet.ipr.res.in/viewer/9677280981?be_auth=NDYzNzg2

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Abstract

The accelerated pace of industrialization has engendered perilous contaminants in aquatic environments, emanating from diverse chemical industries such as textiles and pharmaceuticals. The textile sector, which relies extensively on synthetic dyes, is a major contributor to this predicament. These industrial discharges pose a grave threat to marine and aquatic life, and as a result, the regulatory directives promulgated by central and state pollution control boards for textile industries are highly stringent. In order to tackle this pressing issue, there are ongoing endeavors in various regions of our nation to develop efficacious catalysts for dye degradation.

In this study, Zinc Orthotitanate (Zn_2TiO_4) was synthesized by solid-state reaction method with varying grinding time and calcination temperature. The prepared catalyst was then used for solar photocatalytic degradation of methylene blue, crystal violet dye, and orange dye. The effects of grinding time and calcination temperature on the structural, morphological, and optical properties of the catalyst were investigated using X-ray diffraction (XRD), scanning electron microscopy (SEM), and UV-vis spectroscopy. The results showed that the Zn_2TiO_4 catalyst synthesized at a grinding time of 4 hours and calcination temperature of 900°C exhibited the highest photocatalytic activity for dye degradation under solar irradiation. The catalyst also demonstrated good stability and reusability during the degradation process. The degradation efficiency reached up to 98% after 100 minutes of solar irradiation in case of Crystal Violet dye, and 80 minutes in case of Methylene blue dye, indicating the potential of the synthesized catalyst for practical applications in the field of wastewater treatment. We are also trying for the degradation of collected industrial effluent using this catalyst. This study provides a simple and efficient method for the preparation of Zn_2TiO_4 catalysts with enhanced photocatalytic activity towards dye degradation under solar irradiation.

Preliminary LIBS study of Li_2TiO_3 pellet has also been carried out. Non-destructive nature is the main advantage of this technique which means that the same sample can be analyzed multiple times. Observed results of this study demonstrate the potential of LIBS as a useful tool for analyzing breeding materials used in fusion blanket modules. The details of this work will be discussed in future.