

Seminar

Institute for Plasma Research

Title: Studies on the Use of Nano-Titania for Anti-Stain Applications
Speaker: Dr. Bharti Malvi
Institute for Plasma Research, Gandhinagar
Date: 09th June 2025 (Monday)
Time: 03:30 PM
Venue: Seminar Hall, IPR

Abstract

Textile staining from natural stains such as coffee, tea, and turmeric poses a persistent cleaning challenge, especially when rooted in hydrophilic substrates like cotton. In this study, titanium dioxide (TiO₂) nanoparticles were synthesized using a thermal plasma process at discharge currents of 70 A, 100 A, and 125 A, with the sample from 100 A selected for detailed photocatalytic analysis. Cotton fabrics were coated with varying surface loadings of TiO₂ (10, 25, and 50 mg/cm²) and exposed to natural organic stains. Stain degradation was carried out under a solar simulator for up to 24 hours. The reflectance spectrum was collected using UV-Vis reflectance spectroscopy in the 400–750 nm range over different time intervals. Reflectance data at key wavelengths (430–460 nm) indicated a consistent increase in reflectance over time for TiO₂-coated samples, particularly at higher loadings, corresponding to photobleaching of the stains. The control samples (uncoated) showed negligible change. The 50 mg/cm² TiO₂ coating demonstrated superior photocatalytic activity, particularly for coffee and tea stains, with reflectance recovery up to ~5% higher compared to lower loadings. These results validate the effectiveness of TiO₂ nanoparticle coatings in sustainable, light-assisted stain remediation. The method holds promise for developing self-cleaning textiles and environmentally friendly alternatives to chemical detergents.
