National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Treatment of Industrial Wastewater using Integrated Photocatalyst Synthesized from Waste Material
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Venue	: New Seminar Hall, Chemical Engg. Dept.
Date and Time	: 13 Dec 2024 (11.00 AM)
Abstract	: Wastewater containing different dyes can harm the aquatic ecology and endanger human health. Integrated adsorption and photocatalytic degradation can eliminate the presence of dyes in wastewater. This study explores the synthesis of gamma alumina, reduced Graphene Oxide (rGO), Manganese Dioxide (MnO_2), and rGO/MnO_2 and their efficacy in separating Congo Red (CR), Crystal Violet (CV), Methylene Blue (MB), Malachite Green (MG), Methyl Orange (MO), Rhodamine B (RB), and Tartrazine (TAR) dyes from water-based solutions. The synthesis process involves the transformation of waste aluminium foil into gamma alumina through a controlled procedure using Hydrochloric Acid and Sulfuric Acid. GO was synthesized from graphite powder using the modified Hummers method and is reduced using Hydrazine Hydrate to get rGO. MnO2 and MnO2-rGO are synthesized using the hydrothermal method. The structural and morphological properties of the obtained adsorbents are characterized using BET, FTIR, FESEM, and XRD. The adsorbents are then employed to remove dye from aqueous solutions by varying temperature, agitation speed, pH, adsorbent dose, and initial dye concentration. The results reveal that the optimal conditions for maximum MG dye removal using &gamma-Al_2O_3 (HCl) are achieved at pH 8, with a removal efficiency of approximately 90% after 3 hours, using a 30ppm dye solution, 130rpm agitation speed, and a 1.5g/L adsorbent dose and the adsorbent is re-used for 6 times. For the adsorption of dyes using rGO, MnO_2, and rGO/MnO_2 as the initial concentration of dye increases, the removal percentage falls. Only rGO can adsorb CR, MG, MB, CV, and MO when the concentration was 30ppm, but as the concentration increased to 50ppm CR, MO, and MG are adsorbed mainly, and finally when the initial concentration becomes 100ppm only CR and MO are adsorbed. Mainly CR, and MG are adsorbed by MnO_2. MnO_2/rGO is primarily able to adsorb MG. The findings contribute to the development of eco-friendly and cost-effective solutions for wastewater treatment, utilizing recycled materials for environmental remediation.