National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Utilizing Of Surface Modified Coal Fly Ash for the Remediation of Acid Mine Drainage Water: A Sustainable and Efficient Alternative
Speaker	: Satish Chandra Bhuyan
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Venue	: Seminar Room
Date and Time	: 30 Sep 2024 (4:30PM)
Abstract	: Acid mine drainage (AMD), generated during coal mining activity, is characterized by its low pH and high levels of metals and sulfates and poses a severe threat when discharged into aquatic ecosystems. Traditional methods employ commercial alkalis like lime, caustic soda, and limestone to elevate the pH of AMD water, enabling the precipitation of metals and the formation of gypsum ($CaSO_4.2H_2O$). This study explores the feasibility of utilizing coal fly ash (CFA) for the synthesis of Zeolite X as a low adsorbent for removing pollutants from synthetic and coal mine sump water. The morphology and chemical composition were comprehensively analyzed using XRD and SEM-EDX techniques before and after the adsorption study. The mine water sample was collected from the sumps of coal mine in Odisha, and synthetic water was prepared in the laboratory scale. The surface morphology of Zeolite shows regularly shaped, angular, and porous structures, according to SEM analysis. The porous structure increases surface area and reactivity, making it useful for AMD treatment. Both raw CFA and Zeolite XRD patterns showed amorphous and crystalline phases due to the presence of compounds of silicates and aluminates. Zeolite emerges as a promising and cost-effective alternative for treating AMD, addressing the dual challenges of metal removal and acid neutralization. The maximum sulfate removal efficiency was found to be between 60 to 70 percent. The calcium and sodium content facilitates sulfate precipitation and neutralization reactions, making it a valuable option for mitigating the environmental impact of AMD discharges. This research contributes to the sustainable management of AMD while utilizing an industrial byproduct, presenting a solution for both the mining and thermal power plant and environmental conservation efforts