National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Stabilization of Red Mud Using Alumina-Silicate Based Mineral Precursors
Speaker	: Amruta Dash (Rollno : 522ce1007)
Supervisor	: Suresh Prasad Singh
Venue	: Civil Engineering Department Seminar Room
Date and Time	: 13 May 2025 (9.00 am)
Abstract	: Red mud (RM) is a bauxite residue produced from aluminum industries by Bayer process. High alkalinity (pH value of 10-13) and hazardous heavy metal ions of RM causes serious environmental issues by polluting surrounding soil and water bodies. During the past decade, research is focused on stabilizing RM and its utilization as a construction material for geotechnical applications. Stabilization of RM using alumina-silicate based industrial by-products contributes in the formation of cementitious products through geopolymerisation process and enhances its engineering properties. Hence, in the present study, an attempt is made to stabilize RM using two different industrial precursors such as fly ash and ground granulated blast furnace slag. The index and engineering properties of stabilized RM at different additive contents (0%, 5%, 10%, 20%, 30% and 40%) are assessed. Unconfined compressive strength and CBR is carried out for the raw material and stabilized red mud, compacted to their respective maximum dry density at optimum moisture content for different curing periods (0, 7, and 28 days). It is observed that the alkali present in red mud initiates geopolymerisation reaction upon addition of slag and/or fly ash (source of alumina-silicate). A higher and faster strength development is noticed in slag added specimens compared to fly ash. Results indicate that the stabilized red mud can be used as an erosion control material, structural fill, pavement material etc. based on the amount and type precursors used. SEM, XRD and FTIR analysis is done to study the mineralogical, chemical and microstructural properties of the material and correlate it to the developed strength. Leachate analysis is carried out on red mud to examine the level of major and trace elements.