National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Development of Semi-Lightweight Geopolymer Concrete with incorporation of High Volume Blast Furnace Slag
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Venue	: Civil Engineering Department seminar Hall
Date and Time	: 18 Mar 2025 (4.30 PM)
Abstract	: Semi-lightweight geopolymer concrete (SLWGPC) is a special type of concrete that is lighter than conventional concrete. Additionally, due to the lesser density of SLWGPC, it is easy to handle and transport from one place to another during construction. To develop the SLWGPC, the light weight aggregates such as granulated blast furnace slag (GBFS) and semi-lightweight air-cooled blast furnace slag (SLACBFS) are substituted in place of natural fine aggregates and coarse aggregate (NFA & NCA), respectively, to fulfil the lack of natural resources from the environment. Hence, in the first stage of the study, the strength performance of geopolymer concrete (GPC) was evaluated using fly ash (FA) and ground granulated blast furnace slag (GGBS) as binders in a 50:50 ratio, along with varying GBFS sand content. The optimized results indicated that up to 50% replacement of GBFS achieved superior strength In the second stage, the optimized molarity of sodium hydroxide (SH) and the sodium silicate (SS) to SH ratio in different GPC mixes were analyzed to assess the influence of SLACBFS on the overall composition of SLWGPC. A fixed proportion of FA and GGBS (50:50) with 50% GBFS as a partial replacement for NFA and varying SLACBFS content (0&ndash100%) was used for preparing SLWGPC mixes. These mixes were activated with alkaline solutions of 10M, 12M, and 14M SH, with SS/SH ratios ranging from 1.5 to 3. The findings revealed that replacing 50% of NCA with SLACBFS, combined with a 14M SH solution and an SS/SH ratio of 1.5, resulted in optimal strength & density, lower water absorption, and minimal voids. Thus, incorporating GBFS and SLACBFS waste in SLWGPC enhances sustainability and offers a viable solution for eco-friendly construction practices.