

Characteristic Study of Polymer Sand as a Potential Substitute for Natural River Sand in Construction Industry

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Abstract : The extreme demand for aggregate leads to the exploitation of river-bed for fine aggregates, affecting the environment adversely. Therefore, a suitable alternative to natural river sand is essentially required. This study focuses on preventing environmental impact by developing polymer sand to replace natural river sand (NRS). Development of polymer sand by mixing high volume fly ash, bottom ash, cement, natural river sand, and locally purchased high solid content polycarboxylate ether-based superplasticizer (HS-PCE). All the physical and chemical properties of polymer sand (P-Sand) were observed and satisfied the requirement of the Indian Standard code. P-Sand yields good specific gravity of 2.31 and is classified as zone-I sand with a satisfactory friction angle (37°) compared to natural river sand (NRS) and Geopolymer fly ash sand (GFS). Though the water absorption (6.83%) and pH (12.18) are slightly more than those of GFS and NRS, the alkali silica reaction and soundness are well within the permissible limit as per Indian Standards. The chemical analysis by X-Ray fluorescence showed the presence of high amounts of SiO₂ and Al₂O₃ with magnitudes of 58.879% 325 and 26.77%, respectively. Finally, the compressive strength of M-25 grade concrete using P-sand and Geopolymer sand (GFS) was observed to be 87.51% and 83.82% with respect to natural river sand (NRS) after 28 days, respectively. The results of this study indicate that P-sand can be a good alternative to NRS for construction work as it not only reduces the environmental effect due to sand mining but also focuses on utilising fly ash and bottom ash.

Keywords : polymer sand, fly ash, bottom ash, HSPCE plasticizer, river sand mining

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