

Geopolymer Concrete with Several Mineral Admixtures – Study of Acid Resistance Properties

Y Naveen kumar¹, B Dean Kumar², B L P Swami³

¹Assistant Professor, Department of Civil Engineering, Siddhartha Institute of Engineering & Technology, Hyderabad, Telangana

²Professor, Department of Civil Engineering, JNTU College of Engineering, Kukatpally, Hyderabad, Telangana.

³Professor and coordinator, Research and Consultancy, Department of Civil Engineering, Methodist College of Engineering & Technology, Hyderabad, Telangana.
naveenkumar2018@gmail.com

ABSTRACT

The present experimental investigation is conducted to study the acid resistance properties as part of durability studies. Geopolymer concrete (GPC) equivalent to M40 grade was designed with fly ash, fine and coarse aggregates mixed with an alkaline solution consisting of sodium hydroxide (NaOH) and sodium silicate (Na₂SiO₃). Three more mineral admixtures like ground granulated blast furnace slag (GGBS), condensed silica fume (CSF) and metakaolin (M.K) were employed as part replacements to fly ash. GGBS was used as a replacement to fly ash at percentages varying from 0 to 100. In between, condensed silica fume and metakaolin were used as replacements at a constant percentage of 5. After mixing and casting, a two days rest period is given for demoulding the test specimens. The specimens were cured under ambient temperature for 28 days. The specimens were immersed in 5% solutions of sulphuric acid (H₂SO₄) and hydrochloric acid (HCl) separately. The change in the weight of specimens and the compressive strength were determined after exposing the specimens to acids over durations ranging from 7 to 60 days. It is found that the weight loss is more when exposed to HCl in the case of 100% fly ash and the loss is gradually getting reduced when GGBS with other mineral admixtures is used as a replacement to fly ash. In the case of exposure to H₂SO₄, there is no weight loss. The compressive strength loss is less for the specimens exposed to both HCl and H₂SO₄ over various exposure periods. The experimental study indicates that the performance of GPC under acid exposure is very much better and it is found that the specimens prepared with GGBS and other mineral admixtures are superior to specimens with 100% fly ash. Using the other mineral admixtures as a replacement to fly ash in the GPC mix further enhances its performance and durability when exposed to acids.

Keywords: *Alkaline Solution, Mineral Admixtures, Ambient Curing, Weight Loss, Compressive Strength*

NISDCE'22 – 132