

Assessment and Evaluation of Mechanical and Microstructure Performance for fly ash based Geopolymer Sustainable Concrete

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Abstract

This study aims to reduce the usage of ordinary Portland cement and to improve the usage of the other byproduct such as fly ash. This product helps in reducing the carbon emissions caused by the conventional concrete. This also produces high strength concretes with the use of nominal mixes when compared to conventional concrete. An experimental work conducted by casting fourteen trial geopolymer concrete mixes. Those are designed to study the effects of various parameters on properties of fly ash-based geopolymer concrete especially the compressive strength. These parameters were alkaline liquid to fly ash ratio, the ratio of sodium silicate solution to the sodium hydroxide solution, the concentration of sodium hydroxide solution, the dosage of superplasticizer, rest period and temperature degree. All these parameters studied on compressive strength in three ages (1, 7, & 28) days. Study the microstructure of geopolymer concrete and compare the results with normal concrete by conducted the tests SEM & XRD was another part of this study. The results show that; increasing of curing temperature, concentration of sodium hydroxide, sodium silicate solutions, and rest period, lead to increase in compressive strength. While the increase, by dosage of superplasticizer, alkaline liquid to fly ash, leads to decrease compressive strength. Also, SEM test results show the difference in microstructure between geopolymer and normal concrete.