

ENGINEERING & TECHNOLOGY:

Geopolymers – Green Binders

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Abstract: Applications of polymer based binder material can be an ideal choice in civil infrastructural applications since the conventional cement production is highly energy intensive. Furthermore, it also consumes important amount of natural resources for the large scale production in order to meet the global infrastructure growths. On the other hand, the usage of cement concrete is on the increase and demands looking for an alternative binder to make concrete. Geopolymer based cementitious binder was one of the recent research findings in the emerging technologies. This also envisages the reduction of global warming due to carbon dioxide emissions from cement plants.

Geo-polymer materials are inorganic polymers based on alumina and silica units, they are blended from a wide range of de-hydroxylated alumina-silicate powders condensed with alkaline silicate in a highly alkaline environment. As a result a three dimensional network of silica and alumina tetrahedra sharing oxide bonds is formed. By using smaller amounts of calcium-based raw materials, lower manufacturing temperature and lower amounts of fuel, result in reduced carbon emissions for geopolymer cement manufacture up to 22%-72% in comparison with Portland cement.

Fly ash-based geopolymer binders show excellent short and long-term mechanical characteristics and similar or even better to conventional concrete and these geopolymers are much superior to aggressive environment and fire than conventional concrete. Even though geopolymers appear to be one of the promising building materials for the future, there is still range of concerns that need to be addressed.

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