Geopolymerization of Fly Ash

Henk Nugteren[1], Joseph Davidovits[2], Diano Antenucci[3], Constantino Fernández Pereira[4] and Xavier Querol[5]

[1] Delft University of Technology, DelftChemTech, Particle Technology Group, Julianalaan 136, 2628 BL Delft, The Netherlands
[2] Geopolymer Institute, 16 Rue Galilée, 02100 Saint-Quentin, France
[3] ISSeP, Rue du Chéra 200, 4000 Liège, Belgium
[4] University of Seville, School of Industrial Engineering, Department of Chemical and Environmental Engineering, Avenida de los descubrimientos s/n, 41092 Sevilla, Spain
[5] CSIC, Institute of Earth Sciences 'Jaume Almera', C/ LLuis Sole i Sabaris s/n, 08028 Barcelona, Spain

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Abstract

Geopolymers are inorganic polymeric materials with a chemical composition similar to zeolites but possessing an amorphous structure. In a simple way geopolymers may be seen as man-made rocks. Usually, geopolymers are synthesized at relatively low temperatures from meta-kaolinite, whereby the geopolymerization reaction is favored by its amorphous state. The smaller the particle size of the starting material the higher the reactivity and the geopolymerization rate will be. Due to their low porosity highly-packed microstructure, high-temperature resistance, water resistance, acid resistance, low thermal expansion and fire-proofness, geopolymers can be used in many applications, among which binders in certain specialty cements and for immobilization, stabilization and solidification of a large number of materials, are best known.

The Si/Al ratio, the predominant amorphous structure, and the fine particle size of fly ashes, are appropriate for the synthesis of geopolymers. This paper reviews previous work in which fly ashes were successfully used as starting material for the production of geopolymers. Further, the first results will be presented from a new EC-sponsored project, investigating the possibilities of the production of geopolymers from co-combustion residues. Coal / biomass co-combustion fly ashes are selected because of the relatively high amount of submicronic particles. Particle size distributions may be further enhanced by separation and micro-grinding technologies. The aim is to use the produced geopolymers as new matrices for the immobilization of toxic wastes.

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