








The effects of nanomaterials on the characteristics of aluminosilicate-based geopolymer composites: A critical review

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Abstract

To date, numerous studies have been conducted to clearly understand to effects of nano-materials on the characteristics of geopolymer composites. This review concerned nanomaterials such as nano- Al_2O_3 , nano- SiO_2 , nano- TiO_2 , nano-clay, and nano-metakaolin on the performance of geopolymer composites including freshness, mechanical properties, durability and microstructure. In general, the incorporation of nanomaterials reduces the setting time and fluidity of geopolymers, which can be compensated by developing novel set-retarding and water-reducing admixtures. Meanwhile, nanomaterials can improve the mechanical strengths and durability of the samples by affecting the reaction progress of the geopolymer and the content/type of reaction products, and refining the microstructure, in which good dispersion, proper content and matching components are the keys. Nanomaterials improve the erosion resistance of geopolymers by improving the compactness of geopolymers to prevent the penetration of harmful substances and changing the content/type of the gel phase. In addition, the study of the microstructure also revealed that an appropriate content of nanomaterials provides nucleation sites for geopolymerization and refines the pore structure.