



# Water Absorption, Density, Mechanical Strengths and High-temperature Resistance of Metakaolin-based Geopolymer Concrete Reinforced with Hybrid Polyolefin and Simple Polypropylene Fibers

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*(Date of received: 10/02/2021, Date of accepted: 15/04/2021)*

## ABSTRACT

*In recent years, geopolymer has been introduced as a novel and green alternative to the Portland cement. On the other hand, in terms of technical characteristics, concrete has some disadvantages, most notably low tensile strength and consequently low ductility. Therefore, the use of different fibers in the concrete mixture is considered as an appropriate solution to eliminate these defects. In this experimental study, two types of polymer fibers, including simple polypropylene and 4-element polyolefin hybrid fibers, were used to manufacture fiber reinforced geopolymer concrete specimens. In this regard, fiber reinforced and non-fiber specimens were made and associated tests including: density, water absorption, compressive, indirect tensile and flexural strengths, were performed. Also, to study effect of fibers on high-temperature resistance of metakaolin-based geopolymer concrete, specimens weight and compressive strength loss percentage after exposure to high temperatures up to 800 °C, were measured. The obtained results indicated that using fibers in geopolymer concrete mixture, result in increasing compressive, indirect tensile and flexural strengths and also decreasing in density and water absorption. Further, the use of hybrid fibers due to their ability to inhibit the cracking process from both micro and macro levels, significantly improved compressive, indirect tensile and flexural strengths compared to simple fibers. In term of high-temperature resistance, although the polymer fibers reduced the risk of the explosive sapling of specimens, resulting in less weight loss than non-fiber specimen, but overall, it can be concluded that these fibers did not have a significant effect on the high-temperature resistance of geopolymer concrete.*

## Keywords:

*Fiber reinforced geopolymer concrete, Hybrid fibers, Polyolefin fibers, Mechanical strengths, High-temperature resistance.*