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Microwave Synthesis of ZrO_2 Nanoparticles and its Reinforcement in Geo-Polymer gel

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Abstract : The term "**Nanotechnology**" was first defined by **Norio Taniguchi** of the Tokyo Science University in 1974. Nanotechnology, shortened to "**Nanotech**", is the study of manipulating matter on an atomic and molecular scale. Generally nanotechnology deals with structures sized between 1 to 100 nm and involves developing materials or devices within that size. For comparison, 10 nanometers is 1000 times smaller than the diameter of a human hair. Nanotechnology hasthe capacity to improve our ability to prevent, detect, and remove environmental contaminants in air, water, and soil in a cost effective and environmentally friendly manner. Nanoscience and nanotechnologies are revolutionizing our understanding of matter and are likely to have profound implications for all sectors. The present work involves to study the Microwave assisted synthesis and characteristic properties of Zirconium oxide (ZrO_2)nano powder and its reinforcement in geopolymer gel. Nanopowder was prepared by the citrate sol-gel method. The characteristic properties of nanoparticles are studied by the FTIR, UV-Visible, and XRD analysis, results the presence of tetragonal-ZrO_2nanopowder with particle size of 24.24nm. The geopolymer paste was prepared by mixing of fly ash with an alkali silicate solution in a solid to liquid ratio of 1. The ZrO_2nanopowder was mixed with geopolymer in the ratio of 0.5:5grams, and poured in to moulds to prepare nanoparticle reinforced geopolymer. The characteristic properties of geopolymer are stidied by the Compressive strength, Thermal resistivity and SEM analysis. It is found that small amount of ZrO_2nanopowderwill increases the compressive strength of geopolymer with its NaOH molarity increment, and also shows the high thermal resistivity at 300°C temperature.

Key words : ZrO_2nanopowder, Fly ash, Geopolymer gel, Compressive strength, Thermal resistivity.

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