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ECO-FRIENDLY CEMENT FROM CERAMIC WASTE GEOPOLYMARIZATION

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ABSTRACT

In ceramic tile production, because of various reasons, unsold fired products come out. These are waste tiles and only a little part of them is reused. If these waste tiles were used in geopolymer production, this pollution decreases. In this study, usage of waste tile as pozzolan was studied. The effect of sodium silicate solution with different molar ratio on the compressive strength of Egyptian ceramic waste -based geopolymers is investigated. Three different alkaline solutions with different ratio (10-40%), with different soluble silica contents were used to activate ceramic waste. The primary reaction product was a sodium aluminosilicate gel, while different types of zeolites appeared as minority phases. The percentage and composition of these reaction products were found to depend on both the soluble silica content present in the activating solutions and curing time. In addition, the amount of gel was observed to have a decisive effect on the mechanical strength developing in the material. X-ray diffract grams of geopolymers indicated the existence of the major amorphous phases of ceramic waste, as well as the formation of a new amorphous phase in the geopolymeric matrices. Fourier-transform infrared (FTIR) spectroscopy analysis revealed essential ceramic waste phase transformations within geopolymers that affected their mechanical strength. The results of the current research indicate that a compressive strength is increased with the increase of alkali content, as well as with the increase of sodium silicate in the synthesis of geopolymers. These results enhanced usage of alkali activated ceramic tile waste as eco-friendly cement in adhesion and building materials without more emission of CO_2.

KEYWORDS: Alkali Activation, Ceramic Waste, Compressive Strength, DTA, XRD, FT-IR