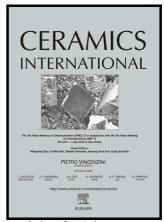
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ACCEPTED MANUSCRIPT

The Influence of Al₂O₃ Nanoparticles Addition on the Microstructure and Properties of Bauxite Self–Flowing Low-Cement Castables

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Abstract:

In this research, the impact of Al₂O₃ nanoparticles addition on microstructure, mechanical, and physical properties of bauxite self-flowing low-cement castables were investigated. Also, the optimum amount of Al₂O₃ nanoparticles is determined. For this propose, up to 3 wt. % Al₂O₃ nanoparticles were added to the bauxite castable compositions. The physical and mechanical properties of castable compositions such as bulk density (BD), apparent porosity (AP), selfflow values (SFV), and cold crushing strength (CCS) were examined. Also, the X-ray diffraction (XRD) and scanning electron microscopy (SEM/EDX) techniques were used for detection the ceramic phase's formation and microstructural analysis of the castables compositions, respectively. Results show that addition of Al₂O₃ nanoparticles up to 1wt. % improved the properties of bauxite self-flowing low-cement castables. As well as, the use of Al₂O₃ nanoparticles led to the formation of the platy and needle crystalline phases such as hibonite (CaO·6Al₂O₃), calcium dialuminate (CaO·2Al₂O₃), and mullite (3Al₂O₃·2SiO₂), between the grain boundaries of the bauxite particles. Also, Al₂O₃ nanoparticles addition led to aforementioned phase formation occur at the lower temperatures.

Keywords: Al₂O₃ nanoparticles, self–flowing, castables, hibonite, mullite.

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