Book of Abstract

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The influence of the addition of brushite on the mechanical properties of geopolymer binder

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The growing need to protect the environment and reuse abandoned raw materials is increasingly used in the construction industry to make in addition to cementitious materials and geopolymer materials. Geopolymers are alkali-activated materials, in which the starting material is mainly some residual material such as: clay, fly ash, slag or red sludge [1,2]. There is growing need to create new binders which can replace portland cement and geopolymer materials are increasingly being used for this purpose. For geopolymerization reaction process high concentration basic solution with alkaline activators are adding and the process itself leads to modifications of the structures of the starting raw materials [1]. Due to growing needs to improve mechanical properties of geopolymer binders, different calcium sources can be added and one of them is brushite-dicalcium phosphate dihydrate [3]. The aim of this paper is synthesis and characterization of Brushite-metakaolin-based geopolymer material samples, with different percentages of pure Brushite material added. Brushite, was obtained by solution precipitation reaction from appropriate acetate salts solution, by green chemistry process. Raw kaolinite clay from the Rudovci deposit (Serbia) was used as Al and Si source for geopolymer binder production. Kaolinite was thermally treated at 750°C for three hours, to produce metakaolin and remove residual organic matter. In order to investigate the influence of calcium phosphate compound on mechanical and microstructural properties geopolymer material samples were synthesized using metakaolin mixed with activator solution prepared from sodium silicate and sodium hydroxide (6M) in relation 1,6 with addition of 2%, 4%, 6%, 8%, 10%, of pure brushite. Phase, structural, and microstructural characterisation were preformed in a mening of XRPD and SEM analysis. Difference between diffractograms of starting materials and Brushite-metakolin analogues indicates that geopolymerization process was successful in all samples. DRIFT technique was used to obtain characteristic vibrations of functional groups in obtained materials. The compressive strenghts of geopolymer binders containing brushite were in a range of 15-55 Mpa. The the highest hardness was achieved by a geopolymer with 10% of brushite.

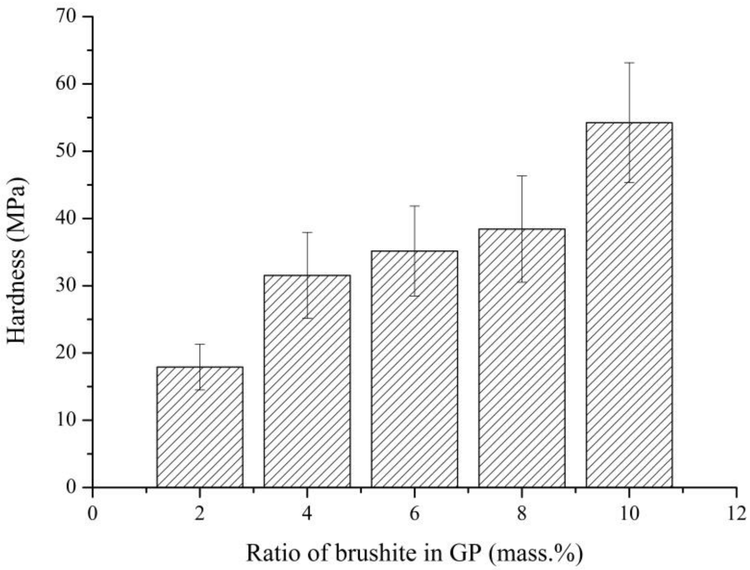

Figure 1. Hardness of geopolymer binders with 2%, 4%, 6%, 8% and 10% brushite

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