EFFECT OF THE PROGRESSIVE SUBSTITUTION OF METAKAOLINITE BY METALLURGICAL RESIDUES ON THE PROPERTIES OF PHOSPHATE CEMENTITIOUS MATERIALS

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The slags from copper industry are currently do not reaching their full valorization potential. On a global scale, these slags are landfilled or used in low-value applications. However, these slags could be used as a potential cement precursor to produce a sustainable cementitious binder, e.g. an inorganic polymer [1], [2]. This novel method could reduce the huge amounts of fayalitic slag generated during the last decades. In the present study, the copper smelter slag from a Belgian industry was used as phosphate cement precursor [3]. Because of extremely short pot life when mixing fayalite slag with phosphoric acid solution [3], [4], this work aims to study a full and partial replacement of pure metakaolinite (MK) with fayalite slag in an environment of phosphoric acid, and its effect on the structure, microstructure and mechanical properties of phosphate cementitious matrices. Several experimental techniques, such as powder X-ray diffraction (XRD), infrared spectroscopy (FTIR), scanning electron microscopy (SEM), as well as the determination of the chemical composition using X-ray fluorescence and the particle size distribution were adopted to characterize the raw materials and the obtained cementitious materials. The ultrasonic tests were used to measure the materials Young modulus. The main results of this work were that the low percentages (from 5% to 15%) of added fayalitic slag made it possible to obtain a good workability, and a low reaction rate. In addition, the obtained phosphate cementitious binders with 5% of slag have a denser microstructure and better mechanical properties than the others cementitious binders.

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