

VitroGeoWaste III

Geopolymeric materials from industrial kaolins and alkali silicates precursors

Oral presentation / Poster presentation

Sergio Martínez-Martínez

Department of Chemical, Environmental and Materials Engineering, University of Jaén, Spain

smartine@ujaen.es

Luis Pérez-Villarejo

Department of Chemical, Environmental and Materials Engineering, University of Jaén, Spain

Pedro J. Sánchez-Soto

Institute of Materials Science of Sevilla (ICMS), Joint Center Spanish National Research Council (CSIC)-University of Sevilla, Spain

Abstract: In the present work it is studied the development of geopolymeric materials with Na or K based on industrial kaolin samples, with variable kaolinite content, and alkaline silicates. The geopolymeric materials obtained and the raw materials used have been characterized by techniques such as: XRF, XRD, FTIR and SEM-EDS. Three ceramic kaolin samples have been considered. In particular, chemical and mineralogical characterization revealed elements distinct of Si and Al, and the content of pure kaolinite and secondary minerals. Metakaolinite was obtained by thermal activation at 750 °C for 1 hour of the sieved (80 µm) kaolin samples. This metakaolinite has been used as a base raw material to obtain geopolymers, using for this purpose a chemical treatment with different formulations of alkaline silicates with NaOH or KOH and variable Si/K molar ratios. The mixed solids and liquids have been heat treated at 70 °C for 24 hours. Subsequently, the formation of geopolymeric materials by hydroxylation and polycondensation characterised with different Si/Al molar ratios has been demonstrated. All these geopolymers were amorphous to X-Rays with characteristics IR bands. Sodium carbonates have been detected by XRD and FTIR, and confirmed by SEM-EDS, in two of these geopolymer materials being products of carbonation of NaOH used as chemical agent under air atmosphere. When potassium silicate/KOH is used as a basic chemical reagent for the dissolution of metakaolinite, the formation of nanoprecipitates has been observed.