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STRUCTURAL, PHYSICOCHEMICAL AND RADIOLOGICAL CHARACTERIZATION OF GEOPOLYMERS

ABSTRACT

This article presents the results of the compositional, structural, radiological and morphological study of geopolymers synthesized from precursors (metakaolin, fly ash, wood ash and red mud) and an alkali activator. The precursor of the geopolymer, ant the geopolymer samples were investigated by Fourier transformation infrared spectroscopy (FTIR), X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), MALDI-TOF analysis, gamma spectroscopy and SEM-EDS analysis. Main goal is defining the optimal precursor for geopolymerization process. Geopolymers are a new class of alumino-silicate materials and are attractive because of their excellent mechanical properties, durability and thermal stability. In addition, they are of great interest due to the reduced energy requirement for their manufacture and the high sustainability. In fact, industrial and natural waste can be employed as precursors of materials for immobilization and adsorption as well as of potential low weight construction materials [1-3]. The synthesis procedure is extremely versatile, thus it is possible to obtain tailored properties by changing several parameters, i.e. the precursors, the solution/solid ratio, or the addition of additives. In this way, it is possible to obtain high porosity materials to be applied in many different technological fields thanks to their high gas permeability, large surface area, high temperature stability, and thermal shock resistance [5,6]. For silica based materials it is known that three different groups are present on the surface: siloxane bridges (-Si-O-Si-), hydroxyl groups (-OH) and coordinative unsaturated Si atoms. Since the hydrophobicity of silica surface increases with the decreasing of the amount of hydroxyl groups, the stability of silica in water can be improved by increasing the sintering temperature or by introducing some organic or inorganic groups to substitute the hydroxyl groups [7]. The modified silica materials, or modified green inorganic materials can attain selective and determined adsorption of environment pollutants. The main aim is to define a cost-benefit, environmental-friendly and sustainable technology for the use or re-use of local industrial waste alumino-silicate materials for the production of new water treatment and construction components based on inorganic polymer ceramic materials.

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REFERENCES

1. S. Nenadović, G. Musci, Lj. Kljajević, M. Mirković, M. Nenadović, F. Kristaly, I. Vukanac: Nucl Technol Radiat Prot, 32 (2017) 261-266.
2. Lj. Kljajević, S. Nenadović, M. Nenadović, N. Bundaleski, B. Todorović, V. Pavlović, Z. Rakočević, Ceram Int, 43 (2017) 6700-6708.
3. S. Nenadović, F. Claudio, M. Nenadovic, C. Raffaele, M. Mirković, I. Vukanac, Lj. Kljajevic, „Chemical, physical and radioogical evaluation of raw materials and geopolymer for building application": J Radioanal Nucl.Chem, https://doi.org/10.1007/s10967-020-07250-1-6. (2020)
4. M. Ivanovic, Lj. Kljajevic, J. Gulicovski, M. Petkovic, I Jankovic-Castvan, D. Bucevac and S.Nenadovic, Sci Sinter, 52 (2020) 219-229.
5. S. Nenadović, Lj. Kljajević, M. Nešić, M. Petković, K. Trivunac, V. Pavlović: Environ Earth Sci, 76 (2017) 76-79.
6. M. Ivanović, Lj. Kljajević, M. Nenadović, N. Bundaleski, I. Vukanac, B. Todorović, S. Nenadović, Physicochemical and radiological characterization of kaolin and its polzmerization products, Constr Build Mater, 68 (2018) 330.
7. Lj. Kljajević, Z. Melichova, D. Kisić, M. Nenadović, B. Todorović, V. Pavlović, S. Nenadović: Sci Sint, 51 (2018) 163-173.