

Ph.D. thesis summary

The Ph.D. thesis entitled “Contributions regarding the geopolymers obtaining by enhancement of mineral wastes”, realized by eng. Dumitru-Doru BUNDUC (BURDUHOS-NERGIȘ), under the scientific advisory of Prof. Univ. Dr. Eng. Petrică VIZUREANU, is structured on five chapters, prefaced by the introduction and followed by a bibliography containing 277 titles. The research carried out by the doctoral student is described over 138 pages containing 21 tables and 68 figures.

The general objective of the doctoral thesis was to conduct a complex and interdisciplinary study in the field of physics, chemistry, materials science and civil engineering on oxide materials based on mineral waste. At the same time, the research aimed at designing, developing and characterizing materials based on the geopolymerization process. Their main advantage is the use of indigenous mineral waste as a source of raw material, as well as its physical and mechanical characteristics comparable to those of classical Portland cement-based materials.

The Ph.D. thesis is relevant for fundamental and applied research in the field of materials engineering, in that it presents the obtaining of oxide materials with properties similar to those of Portland cement-based concrete, with industrial applications. It also describes how to design and develop four types of geopolymers that use as a reference the availability of indigenous raw material sources and the literature in the field of geopolymers. At the same time, the four types of geopolymers are obtained according to their own technological flow and characterized, by specific analyzes in laboratory conditions, from a chemical, structural, physical-mechanical and thermal point of view.

The personal contributions brought to the scientific field through the Ph.D. thesis, as it results from the conclusions of the paper, can be summarized as follows: (i) conducting a complex study of the literature in the field of geopolymers through a critical analysis of the study results for final identification of some elements of originality in the scientific approach of obtaining geopolymers by capitalizing on some mineral wastes; (ii) conducting preliminary experiments in order to identify indigenous mineral waste that has the potential for geopolymerization and (iii) substantiating the opportunity to apply geopolymerization technology for the recovery of indigenous mineral waste.

The personal contributions that have led to the production of geopolymers through recycling of mineral waste consist in (i) the development of a production technology that uses as a source of raw materials mineral waste (power plant ash and glass powder) for production at low temperatures (70 ° C), of some geopolymers with original chemical composition; (ii) the design of materials with a view to obtaining the four types of geopolymers with chemical, structural, mechanical and thermal characteristics comparable to those of Portland cement-based materials; (iii) characterization of geopolymers chemically (chemical composition), structural (macrostructural, microstructural and mineralogical), physical-mechanical (setting time, relative pore distribution, compressive strength and bending strength) and thermal (thermogravimetric analysis and differential thermal analysis) and (iv) establishing the dependence between the chemical characteristics and the structural, physico-mechanical and thermal characteristics of the obtained geopolymers.

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