Physico-Mechanical Properties of Ceramics Based on Aluminosilicates Modified by Metallurgical Waste

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The increase in the amount of industrial waste has become a serious problem for all industrialized countries of the world. Therefore, measures to reduce the formation and disposal of metallurgical waste are relevant. To solve the problem of recycling, the reuse of metallurgical slag in the production of ceramic materials is a good solution. Traditionally, slags are used to produce Portland cement slag, as aggregate for concrete, in road construction, mineral wool, slag pumice, slag casting, etc.

The aim of this work is to study the possibility of using metallurgical slag for the synthesis of ceramics, as an alternative way of managing these wastes.

Aluminosilicates — zeolites and bentonites — were used as the main raw materials; metallurgical slags of lead and copper plants were used as an additive-regulator of ceramic properties.

In the investigation, the composition of the composite systems was prepared by varying the ratio of components - zeolite: bentonite: slag. In the ratios of 50 - 80 wt.% Zeolite, 20-40 wt.% Bentonite and 10-30 wt.% Slag. To ensure the required molding moisture, the moisture content was changed in the range of 15 ÷ 25%. The obtained composite systems were subjected to heat treatment in the temperature range 100–1,000 °C.

A total of 34 ceramic systems were synthesized. It was found that the highest values of mechanical strength of 73.43 MPa are observed in systems with copper slag, humidity 15% and a treatment temperature of 1000 °C. The lowest values are 5.49 MPa, for systems with lead slag with a humidity of 25% and a treatment temperature of 500 °C.

The revealed regularities make it possible to predict the properties of the studied composite systems and create a platform for the synthesis of ceramic materials with the addition of metallurgical slags.

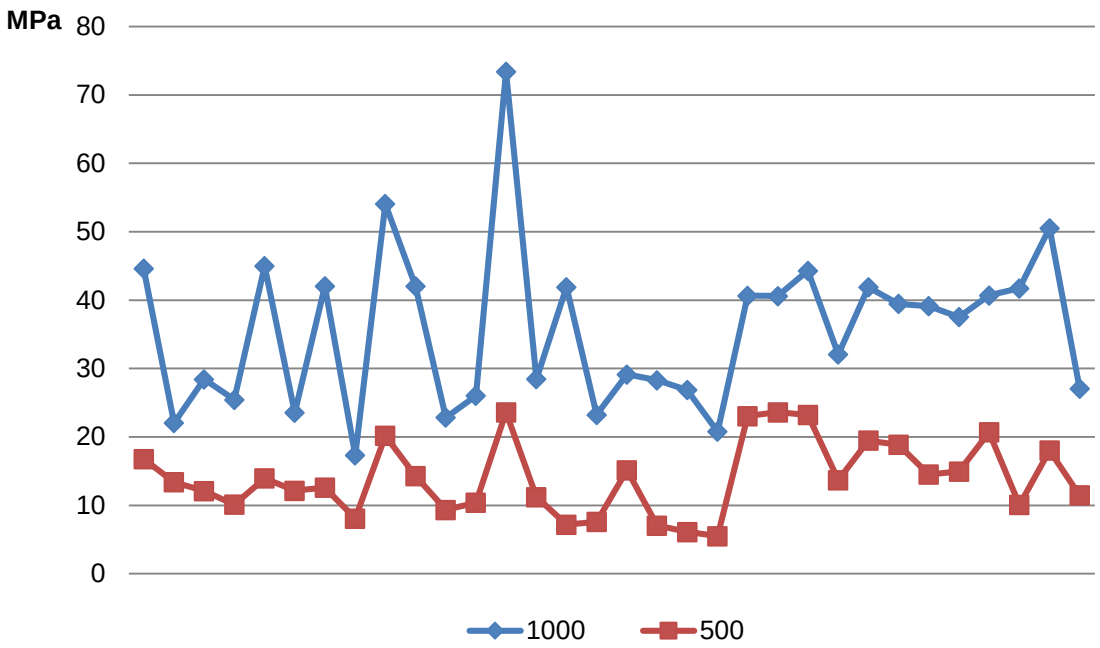

Figure 1: Strength of ceramic systems