

VitroGeoWaste III

Modification of fieldspathoid products of fly ash zeolitization

Oral presentation / Poster presentation

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Abstract: Coal is the largest contributor to modern Bulgarian Energy. Over 50% of the heat and electricity provided comes from coal consumption. However, the use of coal emits tons of waste material (ash), which creates some environmental problems. A wide range of applications characterizes the resulting zeolite materials.

One of the most easily obtained products in the fly ash zeolitization process are the feldspar products - sodalite and cancrinite. They are obtained under room conditions without the need for prolonged stirring. The huge amount of fly ash in Bulgaria and the easy and relatively low-cost synthesis of feldspars predetermines the possibility of their use.

In this research, the possibility of ion exchange occlusion in melts of useful components NO_3^- , NH_4^+ , and K^+ in sodalite, and cancrinite obtained by alkalization of fly ash was investigated.

Pure and mixed NO_3 and OH anion forms of cancrinite were obtained by ion exchange reactions from ϵ sulfate-cancrinite. In addition, Na^+ is exchanged for NH_4^+ . It was found that under the same conditions sodalite is unstable, the structure breaks down and ammonium feldspar (buddingtonite) crystallizes.

The possibility of increasing the amount of useful components by occlusion of salts in different sodalite and cancrinite forms was also investigated. Through computer modeling, the ion exchange of both the charge-balancing cations and the synthetically occluded cation-anion pairs has been proven. The interaction of different cancrinite forms (OH and SO_4 forms) with a KNO_3 melt results in the formation of a material with an altered cationic composition and occluded KNO_3 , which gradually comes out of the structure upon elution.

The results obtained in the work can be a basis for the development of future applications of the modified minerals as slow-acting fertilizers or micro-fertilizers.