

## Recirculation of ash and slag waste at the ceramic brick production

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### Abstract

© 2018, International Multidisciplinary Scientific Geoconference. All rights reserved. The flue ash and slags are accounting a significant part of thermal electric complexes waste, which operating on solid energy fuel. Most of this by-product does not find further application, accumulating in ash-disposal dump areas. Meanwhile, ash-and-slag wastes can widely use as raw materials for the production of building materials. Considering the world trend towards an increase in the share of waste secondary use, it is necessary to forecast their subsequent processing in Russia too. The purpose of work was modeling composition of ceramic charge for Shelangovsk brick factory using Kazan CHP (Combined heat and power plant) furnace-waste as filler. For this, ash and slag wastes were mixed in various amounts with the working charge and with the initial raw clay material. After molding of ceramic small brick, samples were fired at  $T = 980^{\circ}\text{C}$  and then the end products were tested for strength. The results showed that addition 10, 15 and 20 percent of ash to working charge are consistently increasing the strength of ceramic products in compression tests. During the process of manufacturing ceramic products tested changes of their unit-weight and heat setting degree. All products withstand a load of at least 100 MPa. The maximum value of strength is achieved when introducing into the working charge 20% of the ash additive. Simultaneously with the increase in mechanical strength by 12-13%, unit-weight is decreases. At working with natural clay, the ash additive is not so effective. After carrying out physical and mechanical tests, the ceramic products were examined with an SEM and thermal X-ray analysis. The aim of the research was to establish how the ash additives affect the processes of phase transformations occurring in the batch. To determine specificity of reactions between waste and charge minerals was used X-ray analysis. Results are showed that ash and slag waste behaves as active fillers and forming new mineral phases. The obtained results show that the use of ash wastes of Kazan CHP as mineral fillers of ceramic batch is quite acceptable. They introduce improved for physical and mechanical characteristics of wall bricks while reducing their weight. At the same time, the ash additive takes an active part in mineral formation processes, increasing the amount of crystallization contacts in ceramic products.

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### Keywords

Ceramic production, Combined heat and power plant, Flue ash and slag waste, Recycling

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