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Waloryzacja popiołów w celu ich dalszego wykorzystania w materiałach antropogenicznych

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ABSTRACT

The subject of the doctoral dissertation is the valorization of ashes from solid fuel combustion for their further use in anthropogenic materials. In the first part of the dissertation, the theoretical aspects of the issues related to the Circular Economy (CE), combustion by-products and their valorization and application are discussed. Valorization is an activity that aims to improve the quality and thus increase the applicability of a raw material. An analysis of solid fuels was also carried out, with particular emphasis on biomass. Methodologies of the valorization were described and some of the described processes were used in the experiments.

The second part of the work contains a description of experimental research conducted in laboratory and semi-technical scale. The experimental research focused on the valorization of combustion by-products with application of aluminosilicate fuel additives and through the use of grinding and other processes (e.g. sieving, afterburning). The dissertation describes four independent experiments performed to investigate the effects of additives on characteristic ash fusion temperatures (AFT), CO_2 adsorption capacity, and the effects of selected ash parameters on the grinding process while reducing ammonium compounds in the ash.

The results of performed experiments showed that fuel additives have a positive effect on combustion process (higher ash fusion temperatures in most cases), final product (more aluminosilicate composition of ash, which may broaden the spectrum of reuse) and selected properties (CO_2 adsorption capacity). Fly ash-based adsorbent was produced with CO_2 adsorption capacity improved more than 5 times in comparison to the ash source. In this study, the dependences of the grinding process on selected ash parameters (composition, combustion technology) were demonstrated. The results show a possibility of simultaneous reduction of ammonium compounds contained in ash along with a change in the ash grain distribution during the grinding process.