

Formation of Hollow Microspheres in Fly Ashes of Electric Power Stations

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ABSTRACT

One of the most valuable components of fly ashes produced from burning energy-generating coals at electric power stations is aluminosilicate particles less than 1 g/cm³ dense. They are called microspheres (or cenospheres). The technical monitoring of fly ash microspheres carried out at electric power stations of the Russian Federation made it possible to reveal the basic regularities contributing to formation of such hollow spherical microstructures. The influence produced by the chemical and phase-mineralogical composition of mineral admixtures in coals of almost all main coal fields on formation of microspheres has been analyzed. The processes of gas release during thermal transformations, which lead to formation of inner cavities in mineral particles, have been considered. It has been shown that the content of the components capable of gas releasing at the level of 1-3% mass. is enough for foaming mineral particle matters and forming hollow microspheres. The influence produced by thermal effects of coal dust burning on a microsphere portion in fly ashes has been discussed. Using a high-temperature test unit, the model experiments with mineral kaolinite, montmorillonite, illite and pearlite powders have been carried out. Hollow microspheres have been produced, the fraction portion with the density less than 1 g/cm³ being up to 50%. The analysis of the formation regularities of microspheres provides insight into the mechanism of their formation in fly ashes during combustion of solid fuels, which in the future may be turned to beneficial practical use to control these processes.

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