The effect of the addition of solid calcium-based sorbents on the absorption of sulfur during the thermal disposal of car tires

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Sulfur is found in many solid fuels and man-made combustible waste. One of these fuels is energy brown coals. When burned, the sulfur contained in them in the form of acid gases enters the atmosphere and harms the environment. The purpose of this work was to study the distribution of sulfur compounds during the combustion of sulfurous brown coals in the filtration mode and to study the possibility of sulfur neutralization by adding calcium-based sorbents.

The experiments were carried out on a laboratory quartz reactor with a diameter of 46 mm (fig. 1). The air gasification of mixtures of particles of energy sulphurous brown coal of a coal Moscow basin (5-10 mm) and a solid coolant is investigated. In one series of experiments, the heat carrier was porcelain Raschig rings (5-10 mm), and in another - a marble crumb (3-5 mm) capable of chemically binding sulfur compounds. The composition of the resulting ash residue, gaseous products, combustion temperature and rate, as well as the yield and composition of resins were determined.

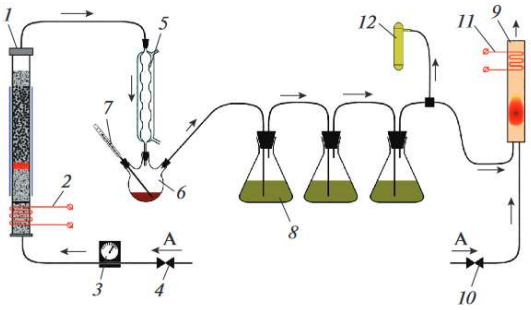

Fig. 1. Schematic diagram of the experimental setup: 1. reactor; 2. electric coil; 3. rotameter; 4, air supply valve to the reactor; 5. water cooler; 6. resin collecting flask; 7. thermometer; 8. bubbling flasks; 9. combustible gas afterburner; 10. air supply valve to the afterburner; 11. electric coil of the afterburner; 12. sampling of gaseous products.

Experiments have shown that when Raschig rings are used as a coolant, with an increase in the mass fraction of rings in the mixture to 50%, the heat of combustion of gaseous products decreases from about 3.60 to 2.75 MJ/m^3, and the proportion of sulfur passing into ash decreases from 12 ± 1% to 1 ± 1%. The addition of up to 50% marble leads to a decrease in the heat of combustion of gaseous products from about 3.60 to 2.55 MJ/m^3. The proportion of sulfur passing into solid combustion products with 50% marble addition increases linearly from 12 ± 1% to 36± 2% compared to the gasification of the initial coal. The resin yield in both series of experiments was approximately 8 ± 1.5% of the fuel mass, the elemental composition of the resins was: C = 74.5-75.5%, H = 6.8-8.4%, O = 10.7-13.3%, N = 0.8-1.2%, S = 2.9-4.6%.

The measurements of the elemental composition of the materials used and the combustion products were carried out in the Analytical center for collaborative using of the IPCP RAS.

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