

CARBON DIOXIDE BINDING IN THE HETEROGENEOUS SYSTEMS FORMED AT COMBUSTION OF OIL SHALE. 2. INTERACTIONS OF SYSTEM COMPONENTS – THERMODYNAMIC ANALYSIS

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SO₂ and CO₂ are essential components of the flue gases formed at oil shale combustion. The first of them is a precursor of acid rain; the other one causes greenhouse effect. In the present work the reactions occurring in the presence of these components in the systems of flue gas – oil shale ash (gas – solid) and flue gas – ash pulp (gas – solid – liquid) were studied. Thermodynamic calculations were carried out using the target-oriented HSC software.

In the case of the first system the changes in the equilibrium content of the components formed in the reactions between flue gas and fly ash along the gas tract in the temperature range of 1400 to 25 °C were calculated. It was found that about 13 % of the CO₂ formed at oil shale combustion can be bound, and that SO₂ and SO₃ can be completely bound by the end of the gas tract. Calculation of the temperature dependencies of Gibbs free energy enabled to show that carbon dioxide and sulfur dioxide can be simultaneously bound by oil shale ash in the system of flue gas – fly ash.

It was also shown that the equilibrium content of the components formed in the second system depends on the amount of flue gas. Ash pulp can bind, depending on the form of CaO present, up to 260 mol of CO₂ per m³ of pulp. Dilution of the pulp does not affect the amount of CO₂ bound by the pulp. Water in the ponds of the ash fields can bind about 60–30 mol of CO₂ per m³ of water, depending on whether the pond is in use or in reserve. In both cases the binding of SO₂ is favourable compared to the binding of CO₂.