

ABSTRACT

of the dissertation for the degree of Candidate of Technical Sciences
**DEVELOPMENT OF A TECHNOLOGY FOR THE COMBINED
THERMAL PROCESSING OF OFF-GRADE COAL MATERIALS AND
DEWATERED EXCESS ACTIVATED SLUDGE**

Completed by Irina Vladimirovna Bogolyubova
at the Department of Chemical Technology of Solid Fuels, T.F. Gorbachev
Kuzbass State Technical University
Specialty: 2.6.12 — Chemical Technology of Fuel and High-Energy
Substances

The aim of this dissertation research is the development of a technology for the combined thermal processing of dewatered excess activated sludge (DEAS) and off-grade coal materials.

To achieve this goal, the composition and properties of the initial raw materials were studied, optimal parameters for the formation of fuel granules were determined, and the temperature-time regimes of pyrolysis were established. It was found that at a temperature of 600 °C and with a binder content based on DEAS of 20 wt.%, a stable yield of pyrolysis gas (up to 55 vol.% CH₄ + H₂) is achieved. A software-algorithmic complex was developed to model the pyrolysis process, taking into account the influence of temperature, process duration, and moisture content of the initial mixture.

Based on this complex, response surfaces were constructed using experimental data. A thermal calculation of a pilot-scale industrial unit was conducted, confirming that the heat released from the combustion of pyrolysis gas is sufficient to meet all thermal demands of the technological line.

Techno-economic calculations showed that the processing cost using the proposed technology is 2–2.5 times lower than that of comparable existing solutions. This confirms the industrial relevance of the development and its alignment with the national strategy for import independence in the fields of energy and processing of technogenic waste.