THERMAL ANALYSIS OF THE TORREFIED GRANULATED COMPOSITE FUEL

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The aim of the work is to determine the degree of thermal decomposition of granulated composite fuel based on wood and peat, torrefing at temperatures in the range of 250 – 290 °C.

Results. Granules from a mixture of pine wood and peat in a ratio of 1:1 are torrefied at atmospheric pressure under conditions of their own gas medium at temperatures of 250, 270 and 290 °C for 60 minutes. Thermal analysis of fuels is carried out in the derivatograph Q-1000 in the range of 20...1000 °C at a heating rate of 7.4 K/min. in an open conical alundum crucible under a still air atmosphere.

The multistage nature of the destruction of composite fuel is due to the thermal properties of the components. In wood, thermal decomposition of hemicellulose occurs in the range of 225–325 °C, cellulose – 305–375 °C, lignin gradually decomposes from 250 to 500 °C.

Analysis of the derivatograms showed that the part of the mass of fuel which is thermally decomposes to 300 °C decreases from 17.5 % in untorrefied fuel to 4.8 % in torrefied fuel at 290 °C.

As a result of torrefaction, the temperature of the start of thermal decomposition of the fuel increases from 178 to 207 °C, and the temperature range of the decomposition expands from 459 °C in untorrefied fuel to 560 °C in the torrefied fuel at 290 °C, respectively. Due to torrefaction, the specific heat of thermal decomposition of composite fuel is increased by 15.4 % at 250 °C, by 19.6 % at 270 °C and by 31.2 % at 290 °C.

Ash content in torrefied fuel increased from 6.9 to 10.0 %. The equilibrium moisture of the granules after torrefaction and storage was within the range 3.1–4.6 % (depending on the processing temperature), while the moisture of the untorrefied granules was 9.9 %, which is a result of an increase in the hydrophobicity of the fuel.

Conclusion. Thermal analysis of granulated initial and torrefied composite fuels based on pine wood and peat showed that the degree of its decomposition during torrefaction depends on the temperature and time of thermal treatment. Torrefaction is an effective way to improve the energy characteristics of biofuels and their compositions with peat.