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Development of Complex Coal Thermal Processing Schemes for Reducing Greenhouse Gas Emissions and Improving Energy Efficiency

Ukrainian coal reserves are presented with a wide range of different coal metamorphism stages which can be grouped into three main groups: brown coal, black coal and anthracite.

The bulk of Ukrainian coal refers to the low-grade coals due to considerable amount of ballast in their volume. The ballast is ash and moisture. Also, Ukrainian coal is often characterized by increased sulfur content.

In the present situation, a rational approach to the use of coal is needed. It is based on comprehensive review of coal as a raw material and complete extraction of components within it.

There are three main directions of coal processing: chemical, thermochemical and thermal processing.

In particular, there is an interest in thermal processing method usage in power engineering and metallurgy. Burning low-grade coal entails a number of difficulties due to the high content of ballast components, dramatically reducing the efficiency of the combustion process. In addition, there are also nitrogen and sulfur, forming chemical compounds that negatively affect the ecological aspect of processing.

Since the Ukrainian resource base implies a big variety of coal types, and there is large number of thermal processing technologies, it is appropriate to evaluate the suitability and effectiveness of using specific coals in specific technologies.

This requires the development of criteria by which to choose the most efficient coal in terms of thermal processing. These criteria should reflect the energy and technological properties of coal, technical and economic parameters of processing and environmental performance of recycling.

One of the integral indicators that measure the structure, composition, moisture content of coal is the enthalpy of formation, which represents the energy released or absorbed, depending on the energy and chemical changes during thermal processing of coal.