CURRENT APPROACH TO IDENTIFICATION OF CORROSION MINERAL PHASES ON HEAT METAL SURFACES AT COAL COMBUSTION

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One of the most effective methods for identifying the mineral composition of various substances is the X-ray diffraction method [1]. The universal software package Match! (Crystal Impact) is used to analyze X-ray data. A difficult task is to determine the quantitative composition of the identified compounds, primarily those that have a small content in the investigated substance. Recording of X-Ray data of coal ash with a high content of salts ([Na_2O] in the ash ≥ 2 %, i.e. salty coals (SC), which determines its high corrosion activity, and scales exfoliated from the surface of steel plates was made by the DRON 4M device.

To improve the analysis of diffractograms in the program Match! there are additional functions that we used for the first time in [2]. These are: the "K-Alpha2" function, which allows to increase the intensity of both low and high intensity reflexes; the "Subtract Background" function, which removes the background that is the cause of the error; the "Smooth Raw Data" function, which reduces noise on the diffractogram.

The use of these functions in our case made it possible to determine a larger number of reflexes and to identify fundamentally significant phases that are formed in smaller proportions (table).

Table. Phase composition of scale of metal plates, mass %

Phase composition	Fe_2O_3	Fe_3O_4	FeO	FeS_x	NaCl	$FeCl_x$
Deposit of SC	Burning coal at 800 °C					
Starobilske	44	25	15	13	~2	~0
Bohdanivske	35	17	28	16	~3	~2
Deposit of SC	Burning coal at 900 °C					
Starobilske	46	20	4	24	~2	4
Bohdanivske	24	44	6	16	~3	7

These tables indicate a decrease in the sum of iron oxides with the higher burning temperature (from 80–85 % at 800 °C to 70–74 % at 900 °C) and a corresponding increase in the content of mostly chlorine-containing compounds.

The obtained data, in addition to methodical advice, indicate the expediency of using the preliminary preparation of the coal for incineration – by methods of water extraction or oil agglomeration, which allow the removal of both chlorine and sulfur compounds [3]. After all, it is they are the cause-increased corrosion of metal surfaces during the combustion of SC.

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3. A. Fateev, T. Shendrik, S. Polishchuk, N. Dunaevska. The energy technological background of involving salty coals into energy balance of Ukraine. 1. Composition of water extracts and the prospects for their utilization // Scientific Bulletin of National Mining University. 2018. N6. P. 30-36.