DEVELOPMENT OF HIGH TEMPERATURE SETUP USING OF ELECTRO-CHEMICAL SENSORS FOR ESTIMATING WATER LAW CONTENT OF GLASSES AND MINERALS

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The chief drawbacks of the currently available methods of estimating the water content in natural objects are the following: poor precision of measurements (electron microprobe analysis), time consuming procedure (of gravimetry), complicated sample preparation and high price (FTIR and ion microprobe analysis) [1,2]. One of the effective methods is coulometric measurement, as it was emphasized by a number of authors [3].

The apparatus using electrochemical sensors has been made for estimating low water and oxygen contents of natural and experimental glasses and minerals.

The method consists in a programmed sample heating at continuous registration of water and oxygen releasing with use of coulometric sensors. The suggested approach in contrast to others makes possible the sample degassing in Ar-O_2 binary mixture under controlled oxygen partial pressure. Diagram of the setup is shown in fig. 1.

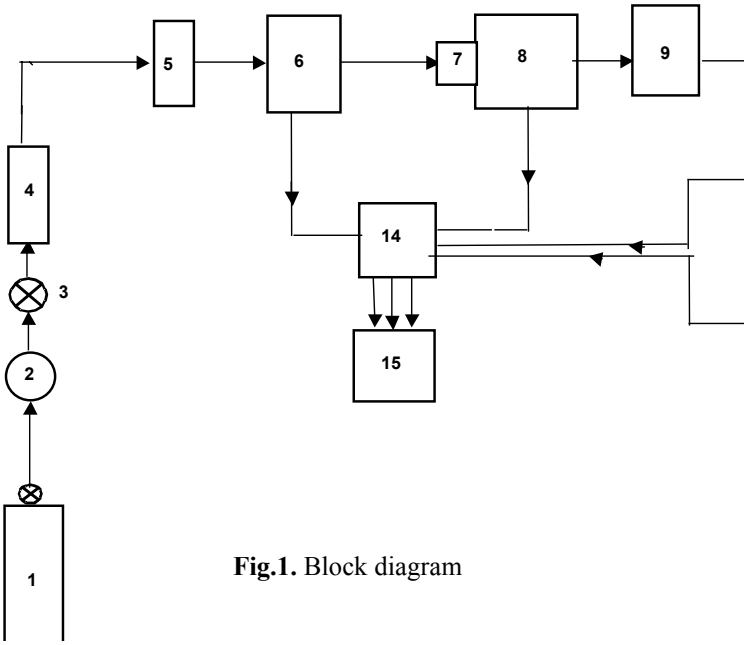

Fig.1. Block diagram

The setup incorporates the following: 1. Cylinder containing inert gas (Ar);
2. Reducer;
3. Valve;
4. Flowmeter;
5. Cryogenic trap for cleaning inert gas from the water;
6. Solid electrolyte cell used to obtain the needed oxygen partial pressure in the inert gas;
7. Gaseous lock;
8. High temperature reactor;
9. Heater of gas communications;
10. Element (based on P_2O_5) susceptible to water;
11. Solid electrolyte cell for the control of the kinetics of the oxygen absorbing / evolving by the sample;
12. Flowmeter;
13. Inducer of gas flow.

Electronic blocks controlling, registration and treating the received information (14) made to specify the oxygen content in the binary mixture flow and to control the reactor and the solid electrolyte cells temperatures, to registrate the water and oxygen evolving from the sample. Collection and treatment of the received information is performed on the data collection device L-154 (15), installed in computer.

The software (program VAM) [4] allows to obtain graphical displays of the kinetics of the water and oxygen evolution at the controlled temperature and velocity of the sample heating.

Preliminary testing of the setup has been currently performed. The setup allows to perform degassing of samples at temperatures up to 1200 ^{o}C, to detect the water in the flow of inert gas within the limit of detection of 1ppm (volume fraction), the oxygen – within the limit of 0,5 ppm.

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