USE OF THE FEATURES IN BEHAVIOR OF A.C.
ELECTRICAL PROPERTIES OF CHALCOGENIDES
UNDER HIGH PRESSURE FOR ESTIMATING THE
PRESSURE VALUES

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One of the features of chalcogenide materials is their ability to significantly change the electrical parameters under the applied pressure over a wide frequency range of the electrical field [1-3]. This fact allows using these materials as working media in pressure sensors. The goal of this work is to demonstrate the possibility of using the features of the pressure dependences of the real and imaginary parts of the impedance of cells with materials based on copper and silver chalcogenides (from the systems $Ag$–$As$–$S$, $Cu$–$Ge$–$As$–$Se$ etc.) as a physical basis for new ways of estimating the pressure value in research of condensed phases at high pressures. It has been found that if with the pressure increase at a fixed frequency of electrical field dielectric losses and the real part of the conductivity increase exponentially, then the pressure dependence of the real part of the impedance has a maximum at a certain pressure $P_{max}$. The appearance of this maximum was confirmed analytically [2]. The graph of the imaginary part of the impedance decreases monotonically with pressure increase and changes the direction of the concavity in the point of intersection with the graph of the real part at pressure $P_{max}$. The pressure $P_{max}$ is linearly dependent on the frequency of the electrical field. Changing the frequency of the electrical field within a certain range of operating frequencies evaluated earlier for certificated materials for sensors, it is possible to provide the pressure in a certain range. The proposed method of estimating the value of pressure in the uncalibrated high-pressure chamber may be implemented by a device consisting of an $ac$-bridge and a pressure sensor which is provided with the inverter. Converter provides the ability to scan the resistance value in the neighborhood of a certain pressure and differentiation of this function to accurately determine the pressure $P_{max}$, when the derivative of the real part of the impedance with respect to pressure is equal to 0 and the derivative of the imaginary part of the impedance with respect to pressure is maximum.

This work was supported by the RFBR (project No. 13-02-00633).