ANISOTROPY OF CONDUCTIVITY OF HIGH - TEMPERATURE MELTS

E.N. Suleimenov and V.A. Luganov

At present time the nature of conductivity of oxide systems melts is continuously under discuss. Some approaches based on the model of electrolitical dissocition are known well. Nevertheless recently a set of datum showing that conductivity of high-temperature oxide melts may be described without using of the model of free ions motion was obtained. In the other words there are two alternative approaches devoted to the explanation of the mechanism of conductivity of oxide melts. To our opinion, there is the only way to solve this question in experimental way. It is obvious that the existence of free low molecular ions in the oxide melt automatically supposed isotropic character of its conductivity. Indeed, any charged ion randomly may be considered as isotropic structure. Oppositely molecular nature of oxide melt conductivity ought to lead to some anisotropic effects which is likely to be examined experimentally. In present investigation we were aimed to observe any effects connected with anisotropy of conductivity of high temperature oxide melts. It was shown that oxide melts under investigation really indicate some properties that is character for the systems having anisotropical conductivity. We investigate a set of oxide melts having composition varying in the next ranges: $SiO2$ (38-44%), $Al203$ (8-20%), CaO (14-40%), FeO/$Fe2O3$ (0-50%). It is of importance, that slag conductivity is mainly determined by iron oxide contents. The choice of rest composition was aimed to leaving unchanged the melting point. We supposed that magnetic field is able to order supramolecular structures that are likely to be formed in the melt in the case when its conductivity is of molecular nature. Consequently one can expect that slag conductivity may change by jump while magnetic field is switched off. We construct especial experimental scheme in order to examine this assumption. An aluminum oxide crucible was placed inside coal solenoid. We show that slag conductivity is really changed by jump when magnetic field is switched of. Namely, the ratio of slag conductivity in the presence and the absence of magnetic field are varied in the range 1.4 - 1.7. Thus reported data allows one to make a conclusion that conductivity of slags under investigation is of molecular (or even supramolecular) nature.