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STRUCTURE AND ELECTROCHEMICAL BEHAVIOUR OF MOLTEN HALOGEN SYSTEMS, CONTAINING IONS OF THE BORON

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Interest to the electrochemical methods of making of the boron is conditioned by possibility of its making of high-purity and in great quantity, and also applications of its as a component of synthesis at the electrochemical synthesis of borides of metals. Two varieties of electrochemical making of the boron are presently realized: electrolysis of oxychemical connections and electrolysis of halogen.

1.1. Boron-containing chloride-fluonide fusions.

Fusion of KCl-KBF_4 (5:1) contains connection of $KCl_{11}KBF_4$ with the temperature of melting 1136 K. Authors [1] by the method of infrared Spectroscopy was investigate fusion of KCl-KF-KBF_4, influence of concentration of boron and fluorine was certain on a structure and composition of complexes of boron in the mixed chloride-fluonide fusion.

In work [2] the diagrams of the state of the chloride systems are investigational, containing KBF_4. An opinion is offered, that the molten lithium system is useless as a working electrolyte for the making of the boron.

Solubility of BF_3 is in fusion of KCl-KF at temperature 873-973 K can arrive 50 mas. % trifluoride boron which badly will dissolve in the lithium system.

1.2. Boron-containing fluoride fusions.

In the systems of KF-KBF_4 by the method of infrared Spectroscopy is set existence of two connections - $KF\ KBF_4$ and $KF\ 2KBF_4$.

Authors [3] confirm maintenance of structure of anion BF_4^-, and mark a presence in fusion of CsF-KCl-KBF_4 of co-ordinating connections, the complexes of composition $[Me(BF_4)_3F]^{3-}$, $[Me(BF_4)_4F]^{3-}$, $[Me(BF_4)_2F_2]^{3-}$ and MeF_4^- are presented, where Me - K and Cs.

The method of electrodeposition of the boron is worked out on a steel cathode in great quantity by the electrolysis of fusion of B_2O_3-KCl-KF at temperature 1123 K in graphite crucible. In addition, the boron of high-purity is got by the electrolysis of fusion, consisting of iodide potassium and tetrafluorineborate potassium at adding to fusion of chlorides of potassium or sodium.

2. Electrode processes are in boron-containing halogen fusions.

Electrochemical researches of electroreduction of the boron are in the molten system $LiCl$-KCl-KBF_4 show twostading process of electroreduction of the boron.

On efficiency of electrodeposition high specific conductivity of the boron influences positively. Her value anymore than permittivity of electrolytes, applied at the electrochemical besieging of the boron.

The process of dissolution of KBF_4 must correspond to the reaction of exchange with halogenides of alkaline metals, which can disintegrate with formation of halogenides of the boron. Stability of BF_4^- anions in molten alkaline chlorides increases among $LiCl < NaCl < KCl$ from the strong effect of cation polarization. Decomposition of ions of BCl_4^- not observed in fusion of *NaCl* and *KCl*.

The electroreduction of the boron in the molten systems of $LiF\text{-}KF\text{-}B_2O_3$ and $BF\text{-}KF\text{-}B_2O_3$ is described. It is reported that a process of electroreduction of ions of the boron in this eutecticum mixture is convertible to speed of polarization 1.0 $V \cdot s^{-1}$ and with the increase of speed of polarization a process becomes quasi convertible.

An electroreduction of the boron is in equimolar mixture of *NaCl-KCl*, includes the preceding reaction of education electrochemically of active particles in form the trifluorine boron.

A process of electroreduction of *B*(III) is in fusion of *NaCl-KCl* MBF_4 (*M* = *Na*, *K*) on a glass carbon electrode is an onephasic process with the transfer of three electrons.

An electroreduction of complexes of the boron is onephasic, three-electronic and carries irreversible character. Surplus of fluorine-ions in fusion is limited by formation of BF_3 and stabilizes fusion.

The mechanism of process of electroreduction and deposition of the boron on a platinum electrode was studied by means of cyclic and chroamperometry in fusion containing $LiF\text{-}NaF\text{-}KF\text{-}KBF_4$ at temperature 973 К.

Using the method of IR-emissive of spectroscopy of fusions, there is set composition of fusion $NaCl\text{-}KCl\text{-}KBF_4$. In this system there are such electro-active particles as BF_4^-, BCl_4^- and $[BF_{4-n}Cl_n]^-$ (n = 1-3). Concentration of chloride-fluoride complexes $[BF_{4-n}Cl_n]^-$ increases with a temperature.

Conclusions.

Analyzing resulted higher given, it should be noted that from oxygen-containing fusions the boron of high-purity is not distinguished, because a product is muddy the far of oxygen. The use of the mixed chloride-fluoride fusions presents considerable interest, because these fusions enable to get the boron of enough high-purity, free of admixture of oxygen at in relation to subzero temperatures of fusion.

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