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ELECTROCHEMISTRY OF TITANIUM IN MOLTEN SALTS

The Institute of Electrochemistry of the Ural Department of the USSR Academy of Science, which I am representing here, is the leading academic institution in the Soviet Union in the sphere of fundamental investigations of high temperature electrochemical processes both in molten and solid electrolytes.

Considerable investigations in the sphere of electrochemistry of titanium have been made byour scientists, namely, metal titanium have been investigated and in the dependence of valency of titanium ions, as an essential potential determining ion in the melt, on the cations composition of salt-solvent has been obtained.

The electrode-equilibrium potentials of titanium have been determined and the dependence of their magnitude on a cation-radius of salt-solvent of electrolyte has been investigated.

The investigations on thermodynamics and kinetics of electrode processes under the anodic dissolution and the cathodic deposition of titanium have been made and the electrochemical behaviour of nitrides, carbides, oxide-carbonaceous compositions of titanium has been studied.

A magnitude of vapour pressure of titanium tetrachloride in the equilibrium state with molten halogenides of alkali metals has been measured and the dependence of the titanium content in the melt for the given composition of the molten salts and the temperature on the vapour pressure of titanium tetrachloride above the melt has been determined.

A structure of cathodic deposition of titanium and the influence (i.e. size, grain forms, purity) of the electrolyte composition and electrolysis regimes has been studied. The compact titanium production, as layers of considerable thickness, which can be employed as well as coatings.

Thus, to obtain a process of titanium deposition on the cathode, it is necessary to reduce a four valent ion of titanium to lower valent forms. In fluorine and fluoride chloridric melts a high concentration of tetrachloride of titanium may be done, but one can see from high complex forming properties of these melts the difficult forming low components of titanium are formed and, consequently, this fact produces difficulties in electrode processes.

We have works based on these fundamental investigations. This fact permits to obtain titanium coatings, i.e. to deposit films on titanium and these films protect from corrosion and to obtain powders of alloys on the basis of titanium.

We suppose that this complex with the results on physico-chemistry and electrochemistry of titanium in melts can be used for the development of technologies to obtain titanium from its halogenides and, possibly, also oxides by electrochemical way bypassing the process of metallothermie.

Thus, the works made by G.T.T. firm on titanium are interesting for USSR and we think that our cooperation will be useful in this domain.

Thank you for your attention.