THERMODYNAMICS OF GALLIUM CHLORIDES FORMATION IN THE LOW-TEMPERATURE MELTS

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The equilibrium gallium potentials relative to chlorine reference electrode were measured in the eutectic 0.575LiCl –0.165KCl-0.260CsCl mixture at 573÷673 K, and in the 0.34NaCl-0.66CsCl mixture at 823÷823 K. Gallium ions were introduced into the melt by anodic dissolution of gallium metal. The measurements were performed at the dissolved gallium concentrations of 0.1 to 0.3 mole percent.

The temperature dependences of conditional standard potentials of gallium for lower and higher valent forms of the dissolved metal, and temperature dependences of conditional redox potential were obtained. In the course of calculation of the conditional standard potentials it was found out that the gallium ions in the melts had two oxidation rates, +1 and +3. At that the average degree of gallium oxidation «Z_{av}» in the salt mixture naturally decreases as the temperature increases and the total concentration of the dissolved metal goes down. The present study revealed the temperature dependence parameters of the equilibrium constant for the reaction of gallium tetrachloride to monochloride reduction by metal gallium. This study gained the data on dependence of decomposition voltage for the gallium mono- and tetrachlorides diluted solutions in the molten salts, and Gibbs energy expression for the mono- and tetrachlorides formation reaction in the diluted melt on concentration of corresponding gallium chloride and temperature were obtained. It was established that the gallium chlorides solutions don’t behave ideally in the melts under study, but the interaction of their components takes place.