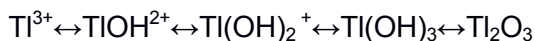


Higher impurity contents (such as Pb, Cu, Cd) are observed in the cathode sediments, because of their close or more positive electrode potentials [8]. The anode's precipitate, thallium oxide  $Tl_2O_3$ , is purer. The only impurity which precipitates along with thallium oxide, due to the close pH of hydrate formation, is iron hydroxide. The purity of the anode sediment is 99.6%. The fact of formation of purer thallium(III) oxide on the anode can be used for refining the rough metal. Results in the literature [14] indicate the possibility of selective precipitation of thallium by using an anode precipitate -  $Tl_2O_3$ , while the purity of rare metal is 99.98%.

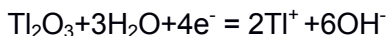
To establish the regularities of electrochemical deposition and dissolution of  $Tl_2O_3$ , cyclic polarization curves were taken at different scanning rates, electrolyte stirring rates and temperatures.

Figure 1 shows cyclic volt-ampere curves at different scanning speeds. In the anode region, where the potential equals 1.5 V, a peak corresponding to the process of oxidation of monovalent to trivalent thallium ( $Tl^+ - 2e^- = Tl^{3+}$ ) is observed.

After that, the oxide formation takes place according to the following scheme:



In the cathode region, two peaks are observed with potentials equaling 0.65 V and -0.17 V, respectively. At -0.17 V,  $Tl_2O_3$  dissolves according to the reaction:



At 0.65V potential, the intermediate products of the hydrolysis of trivalent thallium ( $TlOH^{2+}$ ,  $Tl(OH)_2^+$ ) are probably recovered. With a decrease scanning speeds of the amount of electricity spent on the reduction process, presumably intermediate hydrolysis products, quantitatively goes into the amount of electricity spent to dissolve thallium oxide.

This indicates that the intermediate products of hydrolysis are not very stable and eventually transform into  $Tl_2O_3$ . To confirm this fact,  $Tl_2O_3$  was precipitated in potentiostatic mode, at  $E = 1.5V$ , for 30 seconds. The cathode polarization curves were registered immediately after precipitation, and furthermore after every 5, 10, 15 seconds. These are presented in Fig. 2.