KINETICS OF THE COLLOIDAL PARTICLES FORMATION IN THE MIXTURE OF COBALT AND NICKEL NITRATES SOLUTION UNDER DC DISCHARGE IN AIR*

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Currently, many researches are working to study the properties of bi- and multimetallic catalysts based on transition metals. Indeed, over the past few years, a number of publications have been published devoted to the synthesis of Co and Ni nanosized oxides [1, 2, 3]. The main goal of this study was to study the kinetics of the formation of colloidal particles in a solution of a mixture of cobalt and nickel nitrates under the action of atmospheric pressure direct current glow discharge in air.

The experimental setup was described in [4]. The discharge was ignited between titanium electrodes and the surface of the solution. The distance from the electrode to the solution was 5 mm. The discharge current varied from 20 to 60 mA. The volume of solution was 100 ml. Solutions were prepared by mixing weighed amounts of salts $Ni(NO_3)_2 \cdot 6H_2O$ and $Co(NO_3)_2 \cdot 6H_2O$ (14.53 g for each component per 1 liter of solution). Concentration – 50 mmol/L (molar ratio 1:1). To characterize the kinetics of the particles formation process, the turbidimetry and nephelometry methods were used [4].

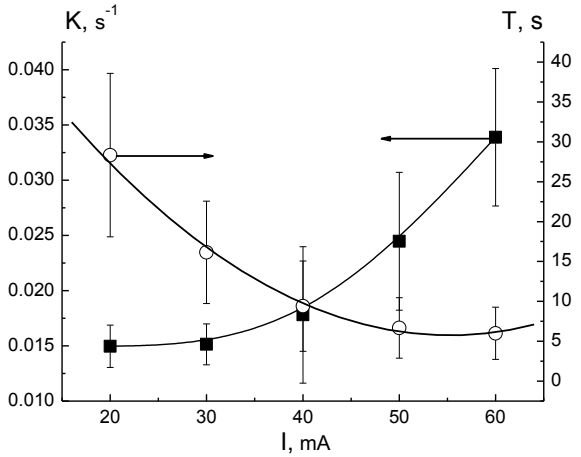

Fig.1. Induction time and effective rate constant of particle formation as a function of on the discharge current. C = 50 mmol/L (Co:Ni=1:1).

During the action of the discharge, the formation of colloidal particles was observed. At the initial time of discharge exposure, suspended substances were formed in the upper part of the anode cell, in the area under the discharge. Over time, after exposure of the solution to the discharge, the particle precipitates. The precipitate and the colloidal solution salts had a characteristic yellow-brown color, which changed slightly over time during the burning of the discharge.

Two characteristic areas can be distinguished in the dependence of the intensity of transmitted light on time. The first so-called induction period characterized by induction time, *T*. The second is the period of formation of insoluble compounds in solution. The kinetics of the passed light intensity is described well with a formal first-order rate law with an effective constant *K*. As can be seen in Fig. 1 the increase of the discharge current lead to the decrease of the induction period in grows of effective rate constant.

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