**USing DC DISCHARGE FOR WATER PURIFICATION FROM HEAVY METALS**

Е.S. Bobkova, A.V. Sungurova, and N.A. Kobeleva

Ivanovo State University of Chemistry and Technology, Ivanovo, Russia, [esbobkova@isuct.ru](mailto:esbobkova@isuct.ru)

Currently, the use of plasma cleaning methods from organic substances, contained in industrial wastewater, is a quite promising area [1]. The potential of plasma technology as means for water purification from inorganic contaminants has not been practically studied. In this paper we investigate the possibility of using the DC glow discharge for water purification from heavy metal ions.

The aim of this work was the study of the discharge in air for the recovery of ions Cr6+ and Mn7+, i.e. transferring them from toxic forms to less toxic Cr3+ and Mn2+, as well as identifying the effect of discharge parameters and initial solution concentration on the efficiency of recovery.

The DC discharge of atmospheric pressure in air is excited by a DC voltage up to 4 kV applied between the metal anode and the surface of the solution. The experimental setup is described in [2]. The distance between the anode and surface of the electrolyte is 10 mm. The discharge current is changed in the range of 20–80 mA. Solution was prepared by dissolving sample of potassium dichromate (K2Cr2O7) or potassium permanganate (KMnO4) of the reagent-grade qualification in the distilled water. The volume of treated solution was 70 ml. After exposure to the discharge for a certain time the solution was analyzed for the concentration of dichromate-ion Cr2O72– absorption at the wavelength of 350 nm, and permanganate ions MnO4- at a wavelength of 550 nm.

The discharge processing indeed leads to the reduction of ions Cr6+ and Mn7+. Moreover, the reduction of Mn7+ goes with essentially higher rate.

The rate and reduction degree depend on the discharge current. The higher is the discharge current, the higher are the rate and extent of reduction. This is probably due to the fact that the increase of the discharge current leads to increase in the concentration of active particles involved in the reduction process. At a given discharge current the extent of reduction depends on the initial concentration of the solution. The higher is the concentration of the solution, the less is the reduction degree.

Processes in acidic medium can be described by the following stoichiometric reactions:

Cr2O72– + 8H + 8H+ →2Сr3+ + 7H2O;

2MnO4– + 10H + 6H+ →2Mn2+ + 8H2O.

For ions Cr6+ the recovery process is reversible, and for ion Mn7+ it is almost irreversible. For the processing time of 400 seconds and the discharge current of 40 mA the efficiency of reduction for Mn7+ reaches 100% for all studied concentrations. The maximum reduction degree of ions of Cr6+ reaches 60% when the initial concentration of 0.058 mmole/l, the discharge current of 40 mA and a processing time of 400 seconds.

This work was supported by the Russian Foundation for Basic Research, project no. 14-02-01113 A.

References

1. E.S. Bobkova, V.I. Grinevich, A.A Isakina, V.V Rybkin // News of Higher Schools. Chemistry and chemical technology. .–2011.–V. 54, № 6.–P. 3-17.
2. E.S. Bobkova, T.G. Shikova, V.I. Grinevich, V.V Rybkin // High Energy Chemistry. - 2012. - V.46, №1. - P.60-63.