N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES CHEMISTRY AND TECHNOLOGY
ISSN 2224-5286
Volume 5, Number 419 (2016), 144 – 151

UDK 541.138

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PRODUCTION OF COPPER POWDERS FROM WATER-DIMETHYLSULPHOXIDE ELECTROLYTES

Abstract. Electrodeposition copper powder of cathodic reduction in organic solvent is investigated and the electrolit, representing solution $Cu(NO_3)_2 \cdot 3H_2O$ in dimethylsulphoxide (DMSO) is offered. Varying concentration of electrolit within the limits of 0,1-0,6 M and cathodic density of a current 200-1200 A/m^2, at temperatures 288-348 K it is possible to receive qualitative copper powders with a given structure and dispersity. In work the electrolyte on the basis of aprotonic polar solvent – dimethylsulphoxide was elaborated and the optimum conditions permiting to obtain electrolytic copper powders with high current efficiency, which differ in microstructure and morphology were determined. The structure electrolytic copper powders received electrolysis of 0,1-0,6 M of solutions $Cu(NO_3)_2 \cdot 3H_2O$ in DMSO is studied depending on key parameters of a mode electrolysis - cathodic density of a current and temperature by the roentgenographical analysis.

Key words: Electrodeposition, dimethylsulphoxide, copper(II) nitrate crystallohydrate, current density, copper powder, roentgenography.

Introduction. Among developing directions of modern researches fine-dispersed powders have the particular interest. A microstructure of fine-dispersed powders gives them a number of new properties in comparison with usual materials. Recently it is given the great consideration to fine-dispersed copper powders possessing specific properties thanks to which it is possible their application for development of new effective materials of different purpose [1].

The basic application field of copper powder is powder metallurgy, where it is used for development of various products of constructional, antifriction and electrotechnical purposes, and also composite materials. In so doing copper powder is an intermediate product of copper manufacture and should meet the certain requirements. The electrolytic method allows producing chemically pure copper powders, which have unique, stable properties (a dendritic shape, a dense texture of particles). The basic advantage of the given method is a possibility of regulation of a powder's structure and properties by means of variation of electrolytic deposition parametres and an electrolyte composition. It allows to influence a structure, a size, a shape and a chemical composition of powders [2,3].

A problem of metals' isolation without the accompanying (parallel) reaction of hydrogen release, characteristic for electrolysis of water solutions, can be solved if to use the solvents possessing higher electrochemical stability, than water. Aproton organic solvents, which do not contain mobile hydrogen and can be reduced at sufficiently high cathodic potentials, are the most admissible in this respect [4-6]. In this connection, in the given work as a solvent it has been chosen dimethyl- sulfoxide $(CH_3)_2SO$ – a cation-tropic compound describable by a high dissolving and ionising ability (ε=47). Also it is known high adsorption activity of the solvent on a border «copper-electrolyte» [7].