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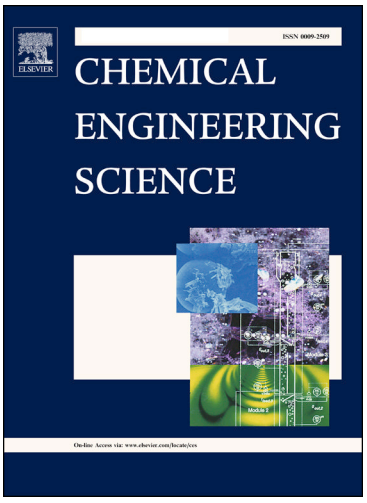

MODELING OF LOCAL MASKLESS ELECTROCHEMICAL DEPOSITION OF METAL MICROCOLUMNS

V.M. Volgin, T.B. Kabanova, A.D. Davydov

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MODELING OF LOCAL MASKLESS ELECTROCHEMICAL DEPOSITION OF METAL MICROCOLUMNS

V.M. Volgin[a,b,*], T.B. Kabanova[b], A.D. Davydov[b]

[a]Tula State University, pr. Lenina 92, Tula, 300012 Russia; volgin@tsu.tula.ru

[b]Frumkin Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences, Leninskii pr. 31, Moscow, 119071 Russia; davydov@elchem.ac.ru

Abstract

The work deals with the problem of fabricating new materials for modern devices of microelectromechanics, microelectronics, biomimetics, etc. using the local electrodeposition of metals. The mathematical model is developed for the formation of 3D microstructures (microcolumns) by the local electrochemical deposition of metal using a moving disk microanode. The numerical solution of the mathematical problem is performed using the finite element method on the irregular grid. The grid is deformed and adaptively remeshed during modeling of deposit growth. Evolution of deposit surface is calculated for various exchange current densities, transfer coefficients, interelectrode distances and various dependences of the current efficiency on the current density.

The results of modeling allow one to determine the relationships between the parameters of electrodeposition and the shape and dimensions of formed microstructures. These data can be used to predict the results of local electrodeposition of metal and to optimize the operation conditions.

Keywords: localized electrodeposition; numerical simulation; morphology of deposit; edge effect

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*Corresponding author. Tel.: +7 4872 352452

E-mail address: volgin@tsu.tula.ru (V.M. Volgin)

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