

Accepted Manuscript

On the theory of 3D multiple nucleation with kinetic controlled growth

Vladimir A. Isaev, Olga V. Grishenkova, Yurii P. Zaykov



PII: S1572-6657(18)30311-4
DOI: [doi:10.1016/j.jelechem.2018.04.051](https://doi.org/10.1016/j.jelechem.2018.04.051)
Reference: JEAC 4038

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 19 January 2018
Revised date: 9 April 2018
Accepted date: 24 April 2018

Please cite this article as: Vladimir A. Isaev, Olga V. Grishenkova, Yurii P. Zaykov , On the theory of 3D multiple nucleation with kinetic controlled growth. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. *Jeac*(2017), doi:[10.1016/j.jelechem.2018.04.051](https://doi.org/10.1016/j.jelechem.2018.04.051)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

On the theory of 3D multiple nucleation with kinetic controlled growth

Vladimir A. Isaev^{a,*}, Olga V. Grishenkova^a, Yurii P. Zaykov^{a,b}

^a *Institute of High Temperature Electrochemistry, Ural Branch of the Russian Academy of Sciences, 20 Akademicheskaya Str., 620137 Ekaterinburg, Russia*

^b *Ural Federal University, 19 Mira Str., 620002 Ekaterinburg, Russia*

* Corresponding author. E-mail addresses: v.a.isaev@mail.ru; v.isaev@ihte.uran.ru

ABSTRACT

The general theory of the potentiostatic current transients for 3D multiple nucleation with kinetic controlled growth has been analyzed. Analytical expressions for the determination of nucleation/growth parameters have been derived. The cases of instantaneous and progressive nucleation have been considered.

Keywords:

Nucleation

Growth

Overlap

Current transients

1. Introduction

Electrochemical methods are very useful for the study of nucleation and growth of a new phase, because it allows to set and control the overpotential (supersaturation) in the system, to define current, charge, volume of a deposit, and a number of nuclei comparatively easy. More information on the mechanism and kinetics of the electrocrystallization can be obtained during the analysis of potentiostatic current transients. Earlier [1, 2] we have studied a problem of the theoretical description of the electrochemical phase formation under potentiostatic conditions. The purpose of present paper is a further theoretical analysis of this process.

Many theoretical and experimental studies of the electrochemical phase formation were carried out for the nucleation with the diffusion controlled growth. Theoretical aspects of this case of electrocrystallization were considered in [3–23]. It is known that there is no exact solution for the problem of 3D phase formation with the diffusion controlled growth. On the contrary, an exact analytical solution of the problem concerning the nucleation with charge-transfer control (kinetic control) can be obtained. However the number of publications dedicated to the study of this case of phase formation is very small [24–30]. In this paper we will analyze the results from [1, 2] to obtain

Download English Version:

<https://daneshyari.com/en/article/6661807>

Download Persian Version:

<https://daneshyari.com/article/6661807>

[Daneshyari.com](https://daneshyari.com)