The Influence of Sodium Citrate and Potassium Sodium Tartrate Compound Additives on Copper Electrodeposition

Jiaqi Ni, Keqing Han^{*}, Muhuo Yu^{*}, Chenyu Zhang

State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering, Donghua University, Shanghai 201620, P.R.China

^{*}E-mail: yumuhuo@dhu.edu.cn, hankeqing@dhu.edu.cn

doi: 10.20964/2017.07.57

Received: 4 April 2017 / Accepted: 12 May 2017 / Published: 12 June 2017

The effects of sodium citrate and potassium sodium tartrate as compound additives on copper electrodeposition from a sulfuric acid solution were investigated using different electrochemical measurements, including linear sweep voltammetry (LSV), cyclic voltammetry (CV), and chronoamperometry (CA). The LSV results revealed that the compound additives limited the hydrogen evolution reaction (HER) and impeded the reduction of copper ions on the surface of a vitreous carbon (VC) electrode. The CV results suggested that the deposition with or without additives was controlled by a diffusion-limited process. The real-time data of the current density vs. time obtained from CA implied that without the additives, the nucleation and growth mechanisms were relatively instantaneous three-dimensional (3D) diffusion controlled. Moreover, the presence of the compound additives did not change the mechanism. Their influence is that the additives absorbed on the electrode surface and/or complexed with the copper ions, inhibiting the reduction of the copper ions and reducing the rates of nucleation and growth.

Keywords: sodium citrate; potassium sodium tartrate; copper electrodeposition; nucleation and growth

[FULL TEXT](#)

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).