

Accepted Manuscript

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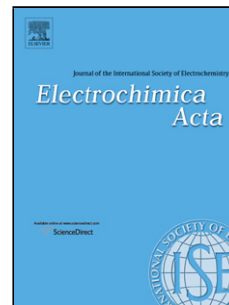
PII: S0013-4686(16)31634-6
DOI: <http://dx.doi.org/doi:10.1016/j.electacta.2016.07.116>
Reference: EA 27731

To appear in: *Electrochimica Acta*

Received date: 14-4-2016
Revised date: 19-7-2016
Accepted date: 20-7-2016

Please cite this article as: Yiyi Yang, Yuning Li, Mark Pritzker, Control of Cu₂O Film Morphology Using Potentiostatic Pulsed Electrodeposition, *Electrochimica Acta* <http://dx.doi.org/10.1016/j.electacta.2016.07.116>

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Control of Cu₂O Film Morphology Using Potentiostatic Pulsed Electrodeposition

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Abstract

The formation of Cu₂O films from an alkaline copper-lactate electrolyte using potentiostatic pulse electrodeposition has been conducted. The effects of the frequency, duty cycle, potential amplitude and electrolyte composition during pulsed electrodeposition on the resulting Cu₂O morphology, crystal structure and orientation have been investigated in detail. Comparisons are made with films produced by potentiostatic DC deposition in the same electrolyte. An increase in the pulse frequency or reduction in the duty cycle causes the Cu₂O grains to become less cubic and more spherical as the crystal growth in the <111> direction becomes less dominant and growth in the <100> direction becomes more favored. Higher Cu(II) concentration, lower electrolyte pH and smaller cathodic overpotential have a similar effect and leads to the formation of Cu₂O crystals with distinct or truncated octahedral shapes through pulsed electrodeposition. Overall, the application of a pulsed potential waveform during Cu₂O electrodeposition in alkaline electrolyte enables the formation of Cu₂O films with controllable morphology with lesser need to alter the electrolyte composition or temperature.

Keywords: Cu₂O electrodeposition, alkaline, potentiostatic pulses, morphology

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