

Photoelectrochemical Stability of Electrodeposited Cu₂O Films

Lingling Wu^a, Lok-kun Tsui^b, Nathan Swami^a, Giovanni Zangari^b

^aDepartment of Electrical Engineering, 351 McCormick Road, PO Box 400743, University of Virginia,
Charlottesville, VA 22904

^bDepartment of Materials Science, 395 McCormick Road, PO Box 400745, University of Virginia,
Charlottesville, VA 22904

AUTHOR EMAIL ADDRESS: gz3e@virginia.edu

CORRESPONDING AUTHOR: Giovanni Zangari

Office Phone: +1 434-243-5474

Fax Phone: +1 434-982-5799

Supporting information

Electrochemical assaying of the concentration of Cu^{2+} ions in various sulfate/acetate/methanol solutions was performed to assess the extent of Cu_2O dissolution upon photocurrent measurements. LSVs were collected from 0V_{SCE} to $-1.5\text{V}_{\text{SCE}}$ with a scan rate of 0.01V/s in (i) a fresh solution, (ii) a fresh solution with 2mM CuSO_4 added, and (iii) a used solution after a total of 105 cycles. The working electrodes were the same Au-Si substrates used for Cu_2O electrodeposition and had an area of 0.25 cm^2 . All experiments were done under ambient room illumination in the same quartz cuvette containing 15mL of solution as in the photocurrent measurements. In the solution containing 2mM CuSO_4 , a peak is present at $-0.07\text{V}_{\text{SCE}}$ that is not observed in the other two solutions. Neither the used nor the fresh solution exhibit the peak present in the 2mM CuSO_4 solution, suggesting that the used solution should have a negligible Cu^{2+} ion concentration. We therefore conclude that dissolution of Cu_2O did not take place during cyclic polarization in the $-0.5\text{V}_{\text{SCE}}$ to 0.5V_{SCE} interval.

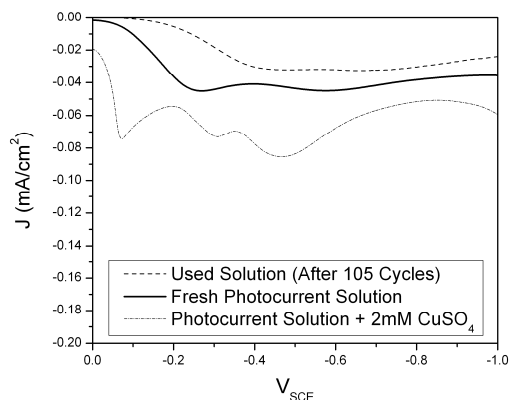


Figure 1. LSVs on Au substrates were taken in a used solution after 105 cycles, the fresh photocurrent solution, and a fresh photocurrent solution with 2mM CuSO_4 .