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标题: Synthesis and Characterization of High-Photoactivity Electrodeposited Cu2O Solar Absorber by Photoelectrochemistry and Ultrafast Spectroscopy

作者: Paracchino, A (Paracchino, Adriana); Brauer, JC (Brauer, Jan Cornelius); Moser, JE (Moser, Jacques-Edouard); Thimsen, E (Thimsen, Elijah); Graetzel, M (Graetzel, Michael)

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摘要: We present a systematic study on the effects of electrodeposition parameters on the photoelectrochemical properties of Cu2O. The influence of deposition variables (temperature, pH, and deposition current density) on conductivity has been widely explored in the past for this semiconductor, but the optimization of the electrodeposition process for the photoelectrochemical response in aqueous solutions under AM 1.5 illumination has received far less attention. In this work, we analyze the photoactivity of Cu2O films deposited at different conditions and correlate the photoresponse to morphology, film orientation, and electrical properties. The photoelectrochemical response was measured by Linear sweep voltammetry under chopped simulated AM 1.5 illumination. The highest photocurrent obtained was -2.4 mA cm(-2) at 0.25 V vs RHE for a film thickness of 1.3 mu m. This is the highest reported value reached so far for this material in an aqueous electrolyte under AM 1.5 illumination. The optical and electrical properties of the most photoactive electrode were investigated by UV-vis spectroscopy and electrochemical impedance, while the minority carrier lifetime and diffusion length were measured by optical-pump THz-probe spectroscopy.

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地址: [Paracchino, Adriana; Brauer, Jan Cornelius; Moser, Jacques-Edouard; Graetzel, Michael] Ecole Polytech Fed Lausanne, Inst Chem Sci & Engn, Lab Photon & Interfaces, CH-1015 Lausanne, Switzerland

[Thimsen, Elijah] Argonne Natl Lab, Div Mat Sci, Argonne, IL 60439 USA

通讯作者地址: Paracchino, A (通讯作者), Ecole Polytech Fed Lausanne, Inst Chem Sci & Engn, Lab Photon & Interfaces, CH-1015 Lausanne, Switzerland

电子邮件地址: adriana.paracchino@epfl.ch

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