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PII: S1572-6657(18)30199-1
DOI: doi:10.1016/j.jelechem.2018.03.030
Reference: JEAC 3946

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 15 September 2017
Revised date: 3 January 2018
Accepted date: 14 March 2018

Please cite this article as: Hussein Kanso, Galina Pankratova, Paolo Bollella, Dónal Leech, David Hernandez, Lo Gorton , Sunlight photocurrent generation from thylakoid membranes on gold nanoparticle modified screen-printed electrodes. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jeac(2017), doi:10.1016/j.jelechem.2018.03.030

Sunlight Photocurrent Generation from Thylakoid Membranes on Gold Nanoparticle Modified Screen-Printed Electrodes.

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Abstract

In this work we report on the photocurrent increasing obtained by using thylakoid membranes "wired" with an osmium redox polymer (OsRP) immobilized onto screen-printed carbon and gold electrodes (SPCEs and SPAuEs), modified with gold microparticles (AuMPs) and gold nanoparticles (AuNPs). Both AuMPs and AuNPs were electrodeposited by using the same electrodeposition method, in order to study the influence of different electrode surface morphologies, namely AuMPs and AuNPs, on the photocurrent generated when illuminated with light with an intensity equivalent to that of sunlight (400 Wm^{-2}). AuMPs/SPCEs showed the highest current density (62.5 µA cm^{-2}) upon illumination probably due to a higher capacitive current directly related to the enhanced electroactive area (A_{EA}) and roughness factor (ρ). Finally, the so modified electrodes AuMPs/SPCE and AuNPs/SPAuE were characterized by using scanning electron microscopy (SEM) showing a different surface morphology, resulting in a higher surface roughness for AuMPs/SPCE compare to AuNPs/SPAuE therefore an intimate interaction between the large thylakoid membrane and the AuNPs. A high photocurrent density of 62.5 µA cm^{-2} was generated at a light intensity of 400 Wm^{-2}.