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$\text{Cu}_2\text{O}@Cu\text{O}$ core-shell nanoparticles as photocathode for *p*-type dye sensitized solar cell

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ABSTRACT: *$\text{Cu}_2\text{O}@Cu\text{O}$ core-shell nanoparticles were synthesized via a facile precipitation-thermal oxidation method consisting in the preparation of Cu_2O nanoparticles in solution followed by a post-treatment at 300 °C, 350 °C or 400 °C in air. From HRTEM micrographs, it was evidenced that Cu_2O particles were uniformly covered by a 5 nm thick CuO layer to form a core-shell structure. This shell may be viewed as a passivating layer that overcomes the natural chemical instability of Cu_2O towards electrolytes for instance. The as-obtained $\text{Cu}_2\text{O}@Cu\text{O}$ nanoparticles were characterized by X-ray photoelectron spectroscopy and electrochemical impedance spectroscopy. Both techniques concluded to the *p*-type conductivity of the $\text{Cu}_2\text{O}@Cu\text{O}$ hetero-structures. These nanoparticles were then deposited as a film on a FTO glass by screen printing and used after sintering as photocathodes for *p*-DSSCs. Photovoltaic activity was confirmed with DPP-NDI dye as sensitizer and tris(4,4'-ditert-butyl-2,2'-bipyridine)cobalt(III/II) as redox mediator.*

Keywords: *core-shell nanoparticles; photocathode; dye sensitized solar cell*

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