

## Highly Efficient Ca-doped CuS Counter Electrodes for Quantum Dot Sensitized Solar Cells

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The present study reports the incorporation of calcium (Ca) into the CuS counter electrodes (CEs) in order to modify the photovoltaic performance of quantum dot-sensitized solar cells (QDSSCs). Ca-doped CuS CEs were prepared by the chemical bath deposition (CBD) method on FTO substrate. For the Ca-doped CuS thin films, copper nitrate and thioacetamide were used as anionic and cationic precursors. Calcium nitrate tetrahydrate was used as doping material. The changes observed in the diffraction patterns suggest that Ca dopant can introduce increased disorder into CuS material structure. EDX analysis was employed to determine the elemental identification and the results confirmed the presence of Cu, S, and Ca on the FTO glass substrate. Electrochemical impedance spectroscopy results displays that Ca-doped CuS CEs have greater electrocatalytic activity and charge transport capacity than bare CuS.