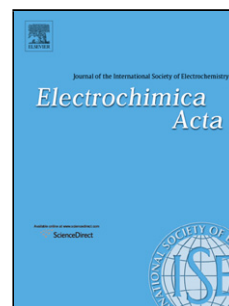


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## INVESTIGATION OF COUNTER ELECTRODE MATERIALS FOR GEL POLYMER ELECTROLYTE BASED QUANTUM DOT SENSITIZED SOLAR CELLS

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**Abstract:** In this article, we report CdS based quantum dot sensitized solar cells (QDSSCs) with methylcellulose–polysulfide gel polymer electrolytes (GPEs) and platinum (Pt), gold (Au) or lead sulphide (PbS) counter electrodes. The optimized GPE has the composition of 30.7 wt.% methylcellulose, 67.4 wt.% Na<sub>2</sub>S, and 1.9 wt.% sulfur with an ionic conductivity of 0.18 S cm<sup>-1</sup> at room temperature. The QDSSCs fabricated with Pt counter electrode exhibits a power conversion efficiency (*PCE*) of 1.42% with a short-circuit current density (*J<sub>sc</sub>*) of 7.30 mA cm<sup>-2</sup>, open circuit voltage (*V<sub>oc</sub>*) of 0.56 V and fill factor (*FF*) of 0.34. When Au is used as the counter electrode, the performance of the cell declined slightly with a *PCE* of 1.30%, *J<sub>sc</sub>* of 10.59 mA cm<sup>-2</sup>, *V<sub>oc</sub>* of 0.47 V and *FF* of 0.26. With PbS as counter electrode, the *PCE* of the QDSSC enhanced to 2.90% with *J<sub>sc</sub>* of 9.61 mA cm<sup>-2</sup>, *V<sub>oc</sub>* of 0.60 V and *FF* of 0.50. This corresponds to an efficiency enhancement of 104%. The good performance of PbS is attributed to the better catalytic activity of PbS for the electron transfer at the counter electrode/electrolyte interface.

**Keywords:** Counter electrode; ; ; , Gel polymer electrolyte, Quantum dot sensitized solar cells, Electrochemical impedance spectra

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