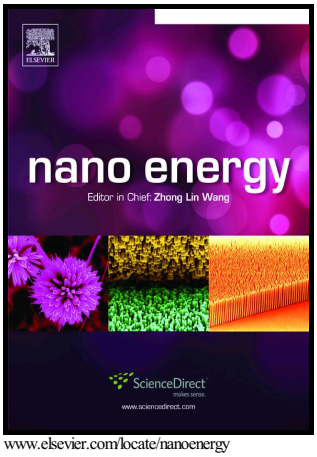

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Large improvement of device performance by a synergistic effect of photovoltaics and thermoelectrics

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Abstract: In this paper, a hybrid generator has been fabricated by connecting a dye sensitized solar cell (DSSC) with a single p-n junction thermoelectric generator (TEG) in series. Both the open-circuit voltage and the short circuit current of the hybrid generator have been enhanced obviously in comparison with the algebraic sum of those of the DSSC and TEG. The increase of non-equilibrium carrier concentration originates from the synergistic effect between the TEG and DSSC, which lifts the quasi-Fermi energy level and improve the photoelectric response rate thus enhancing the open-circuit voltage and current density of the DSSC. As a result, a conversion efficiency of 9.08% has been obtained in hybrid B, which is greatly enhanced by 20.6% and 725.5% in comparison with that of the separate DSSC and TEG, respectively.

Keywords: synergistic effect; thermoelectric; photovoltaic;

1. Introduction

The ever-growing energy demand and environment pollution all around the world are booming the R&D of clean and recoverable energy [1, 2], among which solar cells have always been in the central stage and attracting more and more attention in recent years. Up to now, solar cells have already evolved from the first generation silicon based solar cells to the third generation i.e. sensitized solar cells, and many