

Optical analysis of 1D diffraction gratings patterned on nanocrystalline titania electrodes for enhanced photovoltaic conversion

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Soft lithography is a useful technique that employs elastomeric stamps to fabricate or replicate different types of nanostructures with surface relief patterns. Two layer composite stamps, made of both PDMS and a thin layer of h-PDMS, allow replicating such kind of structures with high fidelity. [1-2]. In our work, we employ 1D diffraction gratings structures for molding nanocrystalline titania. These patterns give rise to optical diffraction of incoming light in the cell, increasing its optical path and thus enlarging the probability of absorption. We find experimental evidence of the improvement of solar to electric energy conversion efficiency as a result of this optical design.

References

- [1] T.W. Odom, J.C. Love, D.B. Wolfe, K.E. Paul, G.M. Whitesides, *Langmuir*, 13 (2002) 5314.
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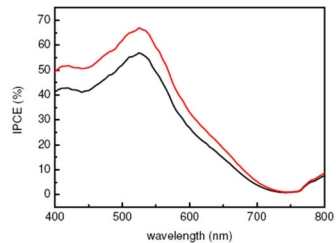
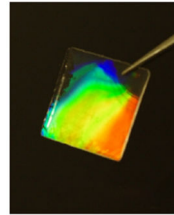


Figure 1: Top: View image of H-PDMS film that has been periodically patterned with a 1D diffraction grating. Bottom: Incident Photon to Collected Electron (IPCE) Efficiency Curves corresponding to the reference (black line) and to the solar cell (red line) of patterned titania.