Two dimensional nanostructured surface relief patterns as optical diffraction gratings for enhanced photovoltaic performance

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The use of surface relief gratings to boost the efficiency of active layers in different types of photovoltaic devices has received a great deal of attention in recent years. [1]-[3] Herein, the surface of nanocrystalline titania layers integrated in dye sensitized solar cells has been periodically patterned by means of a combined soft-lithography and micro-contact printing approach. A significant increase of the photogenerated current is observed as a result of the longer path travelled by light reflected back into the electrode by effect of the so built optical diffraction grating. Such surface relief patterns do not alter the porosity of the electrode, thus not hindering dye loading or electrolyte diffusion through the cell, preserving the rest of electrical parameters of the photovoltaic device intact.

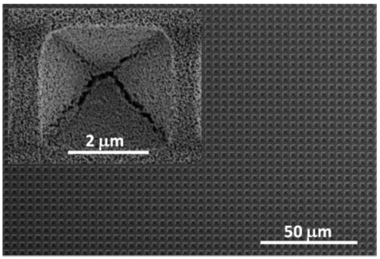

Figure 1: Top view SEM images of a 7.5 µm thick nanocrystalline TiO_2 film that has been periodically patterned to act as photoelectrode in dye sensitized solar cells.

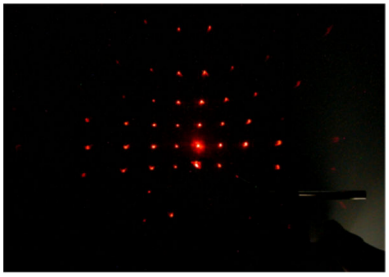

Figure 2: Diffraction pattern observed for the two dimensional array engraved on the surface of a nanocrytalline TiO_2 layer.

References

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