

Nano-imprint technique for back reflector in high efficiency N-I-P thin film silicon solar cells

K. Söderstrom, J. Escarré, R. Biron, O. Cubero, M. Charrière, C. Eminian, F.-J. Haug, and C. Ballif
EPFL, Institute of Microengineering, Photovoltaics and thin-film electronics laboratory, Breguet 2,
CH-2000 Neuchâtel, Switzerland
Corresponding author : karin.soederstrom@epfl.ch

Abstract

In this contribution, the replication of nano-textures enhancing the short circuit current of thin film silicon solar cells onto low cost substrates (glass or PolyEthylene Naphtalate (PEN)) is studied. Optical and morphological analysis is performed to assess the quality of these replicas. Single and tandem a-Si:H solar cells are deposited on top of the master and replica structures to verify their suitability to be used as substrates for solar cells in substrate (n-i-p) configuration. We find similar stabilized efficiencies ($> 8\%$) for tandem cells on a master and a PEN replica of a different texture. The use of a soft stamp to make these replicas is smoothing the original features of the masters. Replications with higher fidelity of fine features are obtained with solid stamps. Such replicas do not exhibit discernible differences when compared to their master textures by atomic force microscopy measurements. Moreover a comparison of single junction amorphous cells made on a replica and on its corresponding master shows no difference in term of light trapping capability of the texture.

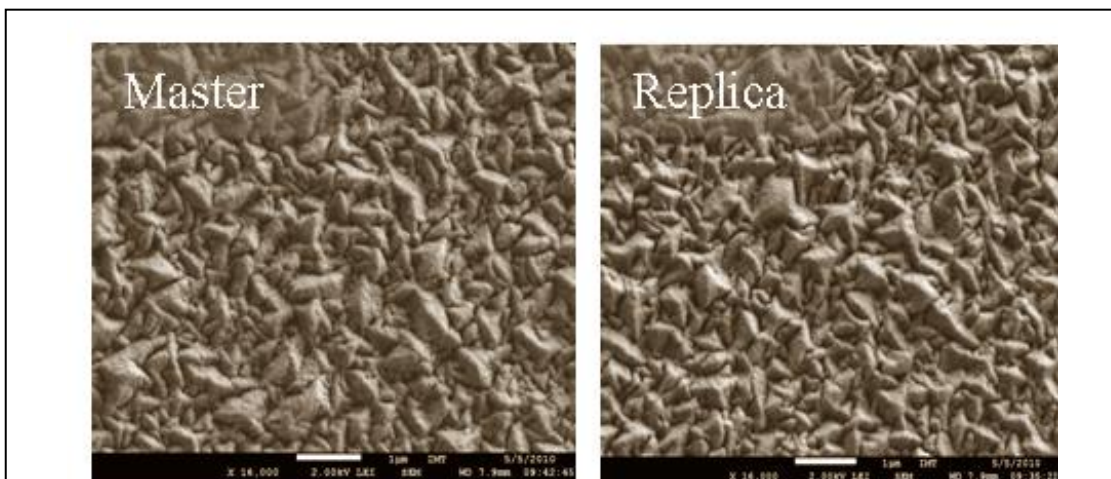


Figure 1 : SEM images of Type B master and its replicating solid stamps. The blank rod at the bottom represents 1 μ m.