

Novel porous architectures towards Perovskite Solar Cells with enhanced harvesting properties

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The growth of perovskite photovoltaic field during last four years has been quick, outstanding and productive permitting perovskite solar cells (PSC) to lead the third generation photovoltaics and being competitive at lab scale with the well-established second one. Hybrid organic-inorganic perovskites showed remarkable optical and electrical properties which are the origin of their exceptional performance¹.

In the present study, three different 1-dimensional photonic crystal-like structures were prepared as photoanodes in PSC employing Physical Vapor Deposition at Oblique Angle Deposition (PVD-OAD) to create the nanocolumnar porous film² with alternative refractive index. The solar cells here prepared showed enhanced harvesting capabilities regarding the reference, obtaining not only higher photocurrents; but also, the improvement in the absorption properties allowed to reduce the total perovskite thickness which boosts the final voltage³. Power conversion efficiencies over 12% were obtained with this photonic crystal like approaches in comparison with only 10% for the reference.

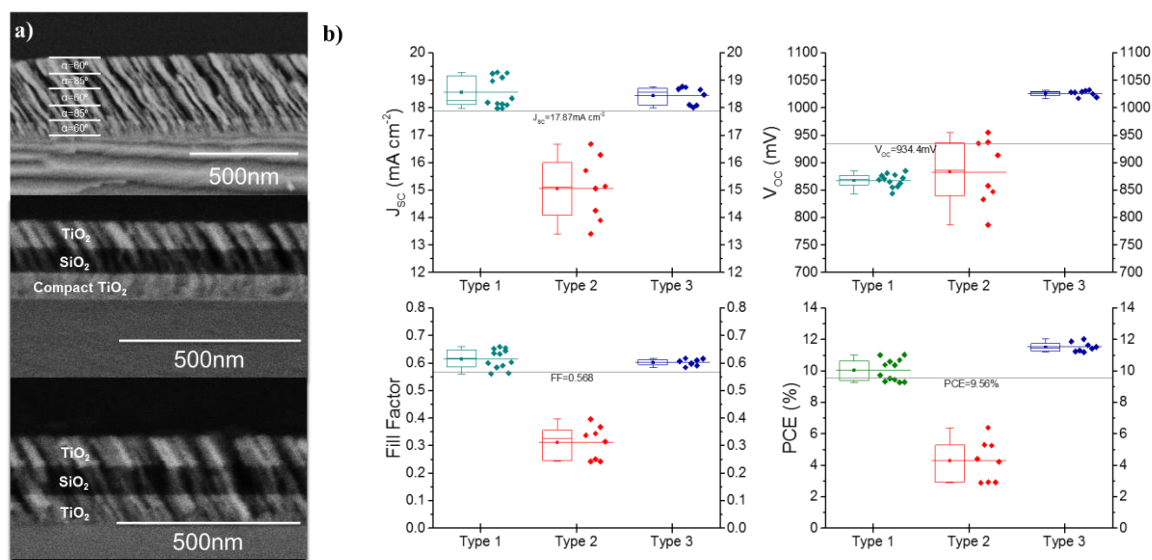


Figure 1. a) SEM pictures (backscattered electrons) of the different photonic crystal like porous photoanodes. b) Box-whiskers plots showing the final photovoltaic properties of the PSC containing different photonic crystal like structures.

- 1 M. A. Green, A. Ho-Baillie and H. J. Snaith, *Nat. Photon.*, 2014, **8**, 506–514.
- 2 F. J. Ramos, M. Oliva-Ramirez, M. K. Nazeeruddin, M. Grätzel, A. R. Gonzalez-Elipe and S. Ahmad, *J. Mater. Chem. A*, 2015, **3**, 13291–13298.
- 3 F. J. Ramos, M. Oliva-Ramirez, M. K. Nazeeruddin, M. Grätzel, A. R. Gonzalez-Elipe and S. Ahmad, *J. Mater. Chem. A*, 2016, **4**, 4962 – 4970.