Na.NO.Tox.SO.C.
NON TOXIC NANOCRYSTAL SOLUTION PROCESSED SOLAR CELLS

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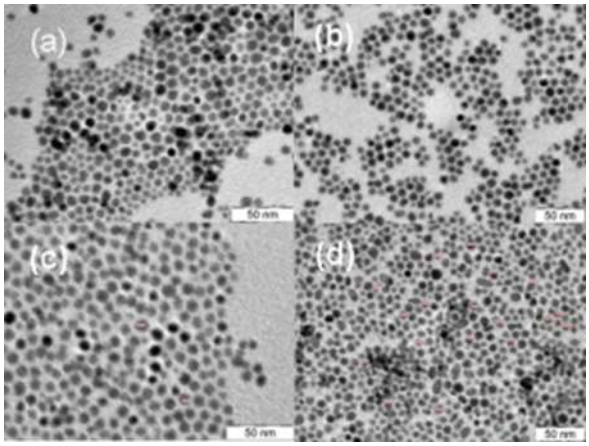
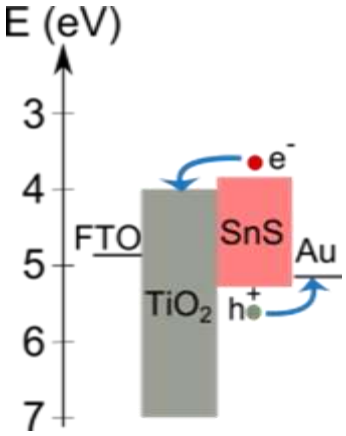
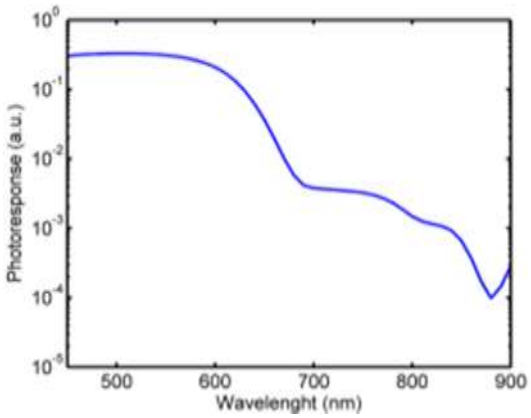
Tin sulfide (SnS) is a 1.4eV bandgap material, very close to the optimum of 1.1-1.3eV for single-junction solar cells, thus being especially suited to harvest to solar energy. Development on colloidal chemical routes for the synthesis of such material enabled its incorporation into roll-to-roll processing techniques such as spraycasting or inkjet printing, which can lower the equipment costs associated to the current photovoltaic technologies. We have incorporated colloidal SnS nanocrystals (NC) into some "traditional" NC-based device architectures, such as depleted or bilayer heterojunction. The former has been reported to exhibit the largest power conversion efficiency among this type of materials, where a porous layer of a large bandgap n-type semiconductor (i.e. titania) allows for the infiltration of the NCs that compose the active area. The latter approach was used to bring together SnS NCs with bismuth sulfide n-type NCs, focusing towards the first all-inorganic environmental-friendly colloidal-based solar cell where the two elements significantly contribute to the overall photocurrent. We have observed photocurrent contribution from SnS NCs in solid state solar cell structures which may open the way towards the development of an alternative material platform towards low-cost, non-toxic nanocrystal solar cells.



TEM images of SnS nanocrystals obtained under different synthetic conditions



Schematic of the band alignment and charge transfer between TiO2 and SnS



Monochromatic photoresponse of the fabricated devices. Contribution beyond 650 nm is only possible due to the contribution of SnS, which is the only absorbing element in this wavelength range