

Mesoscale colloid crystals for dye-sensitized solar cell electrodes

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The engineering of electrode morphology has been studied extensively as a strategy for achieving highly efficient dye-sensitized solar cells (DSSCs); particularly, directional or ordered structures with high crystallinity and high specific area have been pursued. I introduce the mesoscale inverse opal (meso-IO) as a novel morphology for DSSC electrodes; the structure is fabricated by using the mesoscale colloidal crystal template. The meso-IO possesses fully connected skeleton and pore structures that may facilitate both charge and ion transport, potentially enhancing the efficiency of DSSCs accordingly. I discuss the charge transport properties of these IO structures. (Sci. Rep. 2014) I describe the use of multiscale, bilayer IO structures to enhance the light harvesting efficiency. (Nanoscale 2015) Finally, I discuss the in-situ formation of IO structures. (Sci. Rep. 2014)