Solution Processed Quantum Dot Sized Nickel Oxide for Hole Transport Layer in Inverted Perovskite Solar Cells

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Nickel oxide (NiO) has proven to be an attractive material in solar energy application as a hole transport layer (HTL) in perovskite solar cells. NiO colloidal quantum dots (QDs) have unique electrical and optical characteristics, which include increase electric performance, low production cost, and band gap tuning. In this work, NiO colloidal QDs synthesized by the reduction of nickel (II) acetylacetonate with the borane-triethylamine complex in a mixture of oleylamine. For NiO colloidal QDs synthesis, oleylamine act as a capping agent and it helps to control the particle size growth. NiO QDs has been characterized by XRD, FE-SEM, HR-TEM, EDS, UV-Vis absorption, Photoluminescence (PL) and XPS techniques. The HR-TEM results reveal that the average particle size is about 5.5±0.5 nm with clearly visible atomic lattice fringes, which suggesting their better crystallinity features. NiO colloidal QDs deposited on FTO by a spin coating method and controlled the thickness of HTL by rotation speed. The photovoltaic property of fabricated p-i-n perovskite solar cells measured under solar simulator.