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Research areas : All inorganic perovskite solar cells

Title of the research : Fabrication and Characterization of TiO_2 based
Electron Transport layers for CsPbBr_3 Perovskite
Solar Cells



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Description of current and past research:

The current solar cell research field utilizes the electronic and optical properties of halide perovskite minerals to achieve less expensive and highly efficient solar cells. The device structure of all inorganic perovskite solar cells consists of five layers with four interfaces and they are transparent conductive oxide substrate /electron transport layer-ETL /photoactive perovskite layer/hole transport material-HTL /metal electrode contact. One of the factors, which affect the efficiency of the solar cell, is charge extraction and transfer efficiency of the electron and hole collecting layers to the respective back contacts with minimum recombination. The present research work aims to synthesize TiO_2 nanostructures with different morphology to fabricate and to study the charge transport properties of ETL. Synthesis of nanostructures like nanospheres, nanorods has been achieved via the hydrothermal method. The insertion of an interfacial layer is preferred to achieve energy band alignment between perovskite and ETL for the better extraction of charge carriers from perovskite to ETL. The electron transport layer (TiO_2) with different nanostructured morphology is expected to provide more surface active sites to enhance electronic coupling with perovskite molecules in the perovskite layer. In this work, CsPbBr_3 has been chosen as an active material because it is thermally more stable than other perovskite materials. It is expected that the combined effect and suitable combination of morphology and the interfacial layer will improve the efficiency of the device.