Metal Oxide Based on Nanomaterials as Hole Transport Materials for High Efficiency and Stable Perovskite Solar Cells

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Abstract

Perovskite solar cells (PSCs) have certified efficiencies up to now around 25.5 %. This achievement is achieved in the presence of expensive organic hole transporting materials. In contract, inorganic hole transport materials (HTMs) are still crucial and less used because the problem of solution processing. PSCs based on inorganic HTMs would reduce the cost associated with higher mobility and stability. In this way, the application of Cu2O in PSCs as top layer is still complicated due to the difficulty of solution processing. Herein, a solution processing technique is applied for preparing Cu2O nanocubes as a new p type HTL in regular structure (n i p) PSCs. Cu2O nanocubes is achieved in a size range of 60–80 nm without using any surfactants, which are usually toxic and tricky to remove. Cu2O nanocubes with new structure enhances the carrier mobility with preferable energy alignment to the perovskite layer and superb stability. The PSCs based on this Cu2O nanocubes as HTMs could achieve higher efficiency exceeding 17 % with high stability, whereas organic P3HT based PSCs display an efficiency of 15.59 % with less stability. Finally, Cu2O nanocubes is indicates that a promising HTM for efficient and stable PSCs

Biography:

Ahmed Mourtada Elseman, he is obtained his B.Sc., M.Sc., and Ph.D. in Inorganic and Analytical Chemistry from Faculty of Science, Al-Azhar University, Egypt. He was awarded his Ph.D. in perovskite solar cells (February 2017). Also, he obtained two diplomae from Inner Mongolia Institute of Scientific and Technological, Hohhot, China 2015, and the second one from the Institute of New Energy, Wuhan, China, 2017. He works as Research Assistant Professor at the Department of Electronic and Magnetic Materials, Central Metallurgical Research & Development Institute (CMRDI), Egypt. He is awarded Talent Young Scientific (TYSP) Postdoctoral Research Fellow position funded by the Chinese Ministry of Science and Technology (MOST) and organized by North China Electric Power University, Beijing, China, 2017-2018.

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