Efficiency enhancement of spray QD solar cells

Dasom Park, Wonseok Lee, Jinwoong Jang, Sanggyu Yim*

Department of Chemistry, Kookmin University, Seoul 136-702, South Korea

Colloidal quantum dot (CQD) is emerging as a promising active material for next-generation solar cell applications because of its inexpensive and solution-processable characteristics as well as unique properties such as a tunable band-gap due to the quantum-size effect and multiple exciton generation. However, the most widely used spin-coating method for the formation of the quantum dot (QD) active layers is generally hard to be adopted for high productivity and large-area process. Instead, the spray-coating technique may potentially be utilized for high-throughput production of the CQD solar cells (CQDSCs) because it can be adapted to continuous process and large-area deposition on various substrates although the cell efficiency is still lower than that of the devices fabricated with spin-coating method. In this work, we observed that the subsequent treatment of two different ligands, halide ion and butanediethiol, on the lead sulfide (PbS) QD layer significantly enhanced the cell efficiency of the spray CQDSCs. The maximum power conversion efficiency was 5.3%, comparable to that of the spin-coating CQDSCs.

Keywords: spray solar cell, quantum dot, QD