

Impact of Al on ZnO Electron Transport Layer in Perovskite Solar Cells

Abstract

Perovskite solar cells have shown remarkable performance and improvements in terms of solar cell efficiency. The ETL material is one of the important components in perovskite solar cells in conducting electrons to produce current. Here, ZnO was used as ETL material in a perovskite solar cell using the SCAPS 1D simulation software. The ZnO ETL showed poor cell efficiency due to its reaction with the perovskite material. A small amount of Al doped into ZnO was introduced to enhance the physiochemical properties of the ZnO against perovskite materials. Al concentrations were varied between 1 and 4 mol% to observe the effect on cell efficiency. Compared with a conventional ZnO ETL solar cell with 0 mol% Al perovskite, the Al-doped based solar cell showed better performance. Meanwhile, perovskite solar cells with 1 mol% Al-doping and appropriate layer thickness showed the best cell performance in improving the charge transport mechanism, resulting in increased cell efficiency. Thus, the parameters studied can be a guide in the fabrication process.

Keywords

Al-doped ZnO; ETL; Perovskite solar cell; Power conversion efficiency; SCAPS 1D