# Simultaneous Improved Performance and Thermal Stability of Planar Metal Ion Incorporated $CsPbI_2Br$ All-Inorganic Perovskite Solar Cells Based on MgZnO Nanocrystalline Electron Transporting Layer

Mali Sawanta[1], 홍창국[2,3,†]
[1]Chonnam National University; [2]전남대학교; [3]응용화학공학부
(hongck@chonnam.ac.kr[†])

Although the TiO2 is the most popular ETL used in PSCs, its processing temperature and moderate electron mobility hamper the performance and feasibility. Herein, the highly stable, low-temperature processed MgZnO nanocrystal-based ETLs for dynamic hot-air processed $Mn^{2+}$ incorporated $CsPbI_2Br$ AI-PSCs are reported. By holding its regular planar "n-i-p" type device architecture, the MgZnO ETL and poly(3-hexylthiophene-2,5-diyl) hole transporting layer, 15.52% power conversion efficiency (PCE) is demonstrated. The thermal-stability analysis reveals that the conventional ZnO ETL-based AI-PSCs show a serious instability and poor efficiency than the Mg2+ modified MgZnO ETLs. The photovoltaic and stability analysis of this improved photovoltaic performance is attributed to the suitable wide-bandgap, low ETL/perovskite interface recombination, and interface stability by Mg2+ doping. Interestingly, the thermal stability analysis of the unencapsulated AI-PSCs maintains >95% of initial PCE more than 400 h at 85 °C for MgZnO ETL, revealing the suitability against thermal degradation than conventional ZnO ETL.