MOLECULAR ENGINEERING FOR PEROVSKITES SOLAR CELL

Ji-Youn Seo*

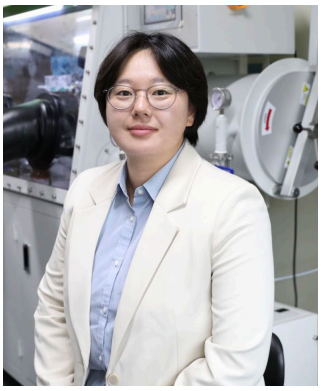
Department of Nano Fusion Technology, Pusan National University, Busan, Korea

j-y.seo@pusan.ac.kr

Keywords: perovskite, crystallization, passivation, molecular engineering, additives, stability

High energy demands of our society stimulate the development of sustainable technologies, such as those based on solar energy conversion or photovoltaics. Perovskite solar cells (PSCs) are an emerging photovoltaic technology that consist of the perovskite film positioned between the electron transport and hole transport layer, while the photovoltaic properties are determined by each component of the structure, as well as the corresponding interfaces. Since 2009, power conversion efficiency of solar cells has already achieved values above 23%. This rapid progress in perovskite solar cell research led to the increased performance and operational stability, which nevertheless remains a challenge towards the commercialization of PSC technologies. In study, new strategies in the design of perovskite solar cells were established based on molecular engineering by addressing perovskite layers with functional analogs. The research objectives focused on two key investigation domains, namely charge recombination in the perovskite grain boundaries or interfaces of perovskite. The investigation of crystal growth mechanism was performed to discover the methods to control the grain size distribution within perovskite films that affects their performance by employing organic functional analogs. The study revealed the crystal growth mechanisms and resulted in the achievement of improving device efficiency and stability.

Biography



Dr. Ji-Youn Seo currently serves as an Assistant Professor in the Department of Nanoenergy Engineering at Pusan National University (PNU), South Korea. With a specialized focus on perovskite solar cells, her research encompasses interfacial engineering, defect passivation, and dopant optimization to develop high-efficiency, stable solar cell technologies that contribute to sustainable energy solutions. Dr. Seo has demonstrated significant leadership in eco-friendly production methods for large-area perovskite solar cell modules and has successfully managed numerous international research projects and collaborations. Dr. Seo's academic journey includes a Ph.D. in Chemistry & Chemical Engineering from École Polytechnique Fédérale de Lausanne (EPFL) under the supervision of the esteemed Prof. Michael Grätzel. Her postdoctoral work involved advancing semi-transparent and stable dye-sensitized solar cells for building-integrated photovoltaic (BIPV) applications at H.GLASS SA in Switzerland. Earlier, as a Research Engineer at Hyundai Motor Company, she contributed to the development of advanced materials and patented processes that enhanced automotive performance. Dr. Seo has an impressive publication record, with numerous articles in top-tier international journals, reflecting her contribution to the field of energy materials and devices. Her work has been recognized with several awards, including the Emerging Scholar Award from The Polymer Society of Korea in 2022. Her leadership in research has attracted substantial funding, including significant grants from the Korea Electric Power Corporation and the KIAT International Cooperative R&D program. These accomplishments underline Dr. Seo’s prominent role in advancing the frontiers of nanoenergy engineering.