Manipulating perovskite materials for highly efficient and stable perovskite solar cells

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Abstract

The general formula AMX3 of inorganic-organic hybrid perovskite materials (A: organic cation, methylammonium (MA) or formamidinium (FA), M: metal, X: halide anion, Br, I) exhibits beneficial properties for high-performance photovoltaic systems such as a suitable band gap (1.5 - 1.4 eV), high absorption coefficient (104 - 105 cm-1), low exciton binding energy (< 50 meV), and long charge-carrier diffusion length (~175 μm). In addition, these materials exhibit easy crystallization at low-temperature by solution processing, resulting in their low cost. Based on above distinct properties of perovskite materials, we have designed a new photovoltaic platform for efficient perovskite solar cells (PSCs). The performance has been remarkably increased to more than 22 % by introducing a mediator to retard the rapid crystallization between organic cations and PbI2, and manipulate the chemical composition of the perovskites via solvent engineering, intramolecular exchange process, and defect engineering, making these routs attractive for attaining low-cost and high-performance devices. In this presentation, I will introduce chemical manipulation of perovskite materials to improve the efficiency and long-term stability of PSCs.

Biography

Sang Il Seok is currently a Distinguished Professor at the School of Energy and Chemical Engineering, Ulsan National Institute of Science and Technology (UNIST), Korea. He also holds a dual appointment as an adjunct professor at the Korea Research Institute of Chemical Technology (KRICT), Korea.

His current research focus is based on inorganic-organic hybrid solar cells, in particular perovskite solar cells.