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Light assisted low temperature sintering for the high-performance flexible dye-sensitized and perovskite solar cells

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There have been significant progresses in the dye-sensitized (DSSCs) and perovskite solar cells (PSCs). Further cost reduction in high-speed manufacturing can be accomplished by continuous roll-to-roll printing processes using a flexible plastic substrate. Lightweight and flexible plastic solar cells can be installed even on non-flat surface, which makes them a possible ubiquitous power source for mobile electronics. The conventional TiO₂ photo-electrodes of DSSCs and PSCs are prepared via a high-temperature sintering at 500 °C after deposition of the TiO₂ paste on fluorine-doped tin oxide (FTO) glass. However, the plastic substrates cannot withstand a sintering process at a temperature above 150 °C. This sintering process is essential since tight TiO₂ inter-particle connections are required for better performance, resulting in the reduction of internal resistance and fast electron transport. Various low-temperature processes have been demonstrated such as chemical sintering, mechanical pressing, hydrothermal crystallization, electrophoretic deposition, microwave irradiation, ultraviolet (UV) light irradiation, near infrared (NIR) oven, and film transfer. However, most of these methods contain quite complicated multi-step processes, not proper for the rapid production of DSSCs and PSCs using the R2R process. We have developed several facile methods for the fabrication of efficient flexible solar cells on plastic substrates by using assisted sintering process. In this talk, several strategies to address these issues will be introduced.

Biography

Min Jae Ko is a Principal Research Scientist at Korea Institute of Science and Technology (KIST) and an KU-KIST Professor at Korea University. He obtained his BS (1995) and MS (1997) degrees from the Department of Fiber and Polymer Science and PhD (2001) from the Department of Materials Science and Engineering at Seoul National University, Korea. He performed his Post-doc work at MIT from 2001 to 2004. Then he moved to Samsung Electronics Co., as a Senior Research Engineer in 2005. His research is focusing on the developments of materials and devices for the next generation flexible solar cells.

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