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HIGH EFFICIENCY PEROVSKITE SOLAR CELLS

CLEAN TECHNOLOGY

Method for thermally induced recrystallization of perovskite thin films for use in high efficiency solar cells, thin film transistors, LEDs, and lasers.

TECHNOLOGY TYPE

Materials
Thin Films
Energy Harvesting
Solar Power

STAGE OF DEVELOPMENT

- Fabrication of high-quality $MAPbI_3$ films demonstrated.

- Ongoing research to test the thin film in solar cell devices.

IP PROTECTION

U.S. Utility Patent Filed
Methods of Thermally Induced Recrystallization

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TECHNOLOGY SUMMARY

Perovskite solar cells are fabricated from low-cost, earth abundant materials and can be processed over large areas with low energy methods. In the last ten years, efficiencies of these perovskite-based solar cells have shown an unprecedented increase from 3 percent to over 22 percent, making them competitive with mature thin film solar cell technologies. Current perovskite fabrication techniques, however, fail to monitor and regulate nucleation and crystal growth kinetics. This inability to regulate crystallization prevents the commercial development of high-quality and high-efficiency perovskite thin films.

Researchers at the University of Utah have developed a method for thermally inducing recrystallization of perovskite thin films to create superior solar cell devices. Using an amine gas atmosphere technique, perovskite is recrystallized from a liquid intermediate. This technique provides enhanced control of crystallization, thereby improving thin film quality. The resulting thin films exhibit an increase in grain size and crystallinity of up to two orders of magnitude over the state-of-the-art fabrication techniques. When implemented into solar cell devices, this increases the overall performance and stability due to reduction of detrimental grain boundaries.

FEATURES AND BENEFITS

- Improves uniformity and quality of perovskite thin films.
- Enables long grain crystallization of perovskite materials for solar cell efficiency that rivals silicon solar cells.
- Offers low temperature fabrication.

RECENT PUBLICATIONS

Jacobs, D.L., Zang, L. (2016). Thermally induced recrystallization of MAPbI3 perovskite under methylamine atmosphere: An approach to fabricating large uniform crystalline grains. *Chemical Communications*. 52(71): 10743-10746. doi: 10.1039/c6cc04521a

INVENTOR PROFILE

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