A system for depositing blended thin films to improve the fabrication of organic solar cells

Unmet Need

Many modern technology applications benefit from the use of organic-based functional thin films, including organic solar cells. The superior functionality of these materials is often achieved through the combination of components rather than relying on a singular component. Techniques that are currently used to control the deposition of functional organic thin films require either can’t accommodate components with different solubility properties or cause degradation of the materials they’re trying to deposit. It remains a technological challenge to achieve the co-deposition of two or more organic materials with different properties into a blended thin film with desired functionality.

Technology

Duke inventors have reported a system for depositing blended thin films intended to improve the fabrication of organic solar cells. Specifically, this is a method to deposit blended thin films using emulsion-based, resonant infrared matrix-assisted pulsed laser evaporation (RIR-MAPLE). Aspects of both physical vapor deposition and solution-processing are combined by first dispersing the target polymer in an emulsion with water to absorb laser energy and then following this with a relatively low energy infrared Er:YAG laser. This technology has been demonstrated to achieve a stabilized power conversion efficiency of over 12% for perovskite solar cells.

Other Applications

This technology could be used for a variety of other applications that use blended polymer thin films, including organic electronics, opto-electronics, optics, sensors, and advanced bio-surfaces.

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Meet the Inventors

Stiff-Roberts, Adrienne
McCormick, Ryan

Department

Electrical & Computer Engineering (ECE)

Publication(s)

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External Link(s)

• From the lab of Dr. Adrienne Stiff-Roberts
• Laser Evaporation Technology to Create New Solar Materials (Duke ECE, 2018)

Advantages

- Fabrication technique that could enable the improvement of organic solar cell efficiencies
- Photochemical degradation of polymer reduced and molecular weight of polymer maintained after deposition process
- Unaffected by solubility properties
- Demonstrated to produce device-quality films