Efficient and Stable Perovskite Solar Cells with All Solution Processed Metal Oxide Transporting Layers

Tech ID: 27223 / UC Case 2015-556-0

SUMMARY
UCLA researchers in the Department of Materials Science and Engineering have developed a novel lead halide perovskite solar cell with a metal oxide charge transport layer.

BACKGROUND
Lead halide perovskite solar cells offer excellent photovoltaic efficiencies (up to 15%), but both the perovskite material and the charge transport layers have poor stability, where the device degrades within days under normal conditions. Specifically, organic charge transport layers are important for energy level matching and charge transport, but their use is limited because they have poor device stability and are costly to fabricate. The use of inorganic materials to replace the organic transport layers offers a promising avenue to circumvent the disadvantages of these layers for solar cell applications.

INNOVATION
Professor Yang Yang and his research team have developed a unique perovskite solar cell that uses metal oxide films for the charge transport layer. Metal oxides offer the advantage of higher carrier mobility and superior stability than typical organic materials and they can be processed easily via solution. This unique lead halide perovskite solar cell has achieved a ~16% efficiency and improved stability of 60 days under normal operating conditions.

APPLICATIONS
▶ Solar cells
▶ Opto-electronic devices
▶ Radiation detector
▶ LEDs
▶ Lasers
▶ Memory devices

ADVANTAGES
▶ ~16% power conversion efficiency
▶ 60 day stability under normal conditions
▶ Metal oxide charge transport layer
▶ Solution processable

RELATED MATERIALS

OTHER INFORMATION
Full Perovskite Portfolio

PATENT STATUS

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<tr>
<th>Country</th>
<th>Type</th>
<th>Number</th>
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<td>United States Of America</td>
<td>Issued Patent</td>
<td>10,693,071</td>
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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
▶ Titanium Oxide as the Window Layer for Metal Chalcogenide Photovoltaic Devices
▶ Silver Nanowire-Indium Tin Oxide Nanoparticle As A Transparent Conductor For Optoelectronic Devices
▶ Highly Efficient Perovskite/Cu(In, Ga)Se2 Tandem Solar Cell
▶ A Solution Method To Improve Nanowires Connection And Its Applications In Electro-Related Areas
▶ Conjugated Polymers with Selenium Substituted Diketopyrrolopyrrole Unit for Electronics Devices
▶ Solution Synthesis and Deposition of Kesterite Copper Zinc Tin Chalcogenide Films
▶ Design of Semi-Transparent, Transparent, Stacked or Top-Illuminated Organic Photovoltaic Devices
▶ 2D Perovskite Stabilized Phase-Pure Formamidinium Perovskite Solar Cells and Light Emitting Diodes