Increased Organic Photovoltaic Efficiency

Technology No. z08184

IP Status: Issued US Patent; **Application #:** 12/586,383

Improved Photovoltaic Cells

An advance in solar cell construction utilizes a metallic cathode and patterned anode to define a plasmonic cavity containing the organic photovoltaic layers. The tunable cavity confines surface plasmons generated by incident light within the organic photovoltaic layers in order to enhance photoconversion efficiency. Rather than using 'gold standard' indium tin oxide (ITO) as a transparent electrode, the patterned photonic structure can use much lower cost silver or aluminum with performance expected to be equivalent with ITO. Unlike ITO the patterned metallic photonic structure is compatible with reel-to-reel manufacturing, significantly decreasing manufacturing costs.

Surface Plasmons Harness Fuller Spectrum

Currently, many organic photovoltaic cells are designed to absorb a relatively specific set of wavelengths. As surface plasmons are introduced and enlarged in the anode, more wavelengths become absorbed, leading to absorption of a broader spectrum of incident light, which is expected to yield efficiency performance comparable to ITO. Two of the critical parameters in the solar market are efficiency and cost per watt. This solar cell architecture is expected to be comparable with state-of-the-art ITO-based solar cells from an efficiency perspective, but less expensive from a cost per watt perspective.

BENEFITS AND FEATURES OF PLASMONIC CAVITY ARCHITECTURE:

- A patterned metallic anode that with the cathode define a plasmonic cavity that enhances photoconversion efficiency in organic photovoltaics
- Broad spectrum surface plasmonic enhancement expected to provide efficiency comparable to Indium Tin Oxide with much lower material cost
- Compatible with reel-to-reel manufacturing to further reduce cost

Phase of Development Prototype Development

Researchers: Sang-Hyun Oh Associate Professor, Department of Electrical and Computer Engineering

https://license.umn.edu/product/increased-organic-photovoltaic-efficiency