Light Management Technology for Organic Photovoltaics

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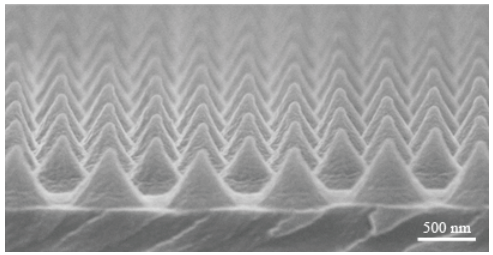

Fig. 1 SEM micrograph of moth eye structure.
(Each cone has 500-700 nm height.)

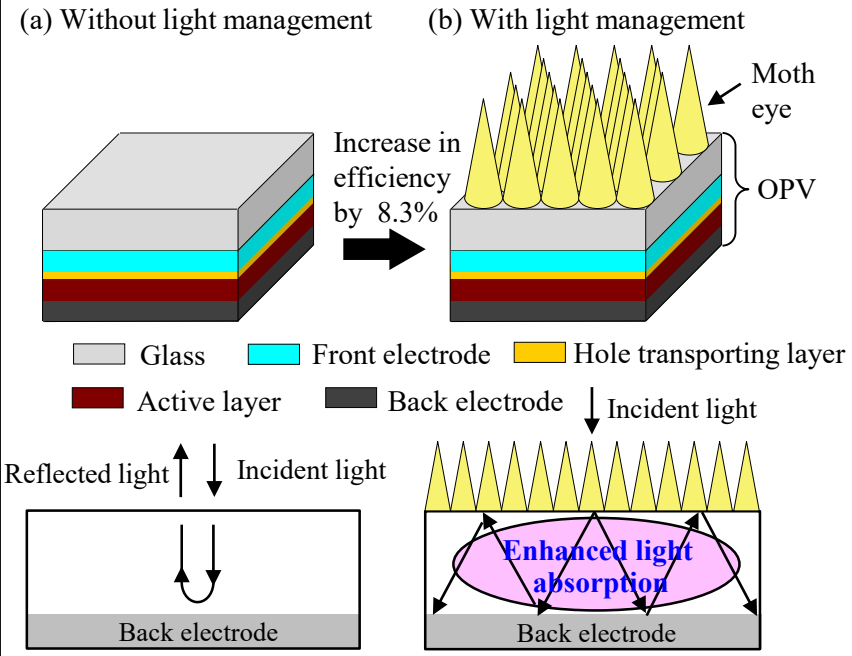

Fig. 2 Illustrations of the device structure of an OPV cell (top) and the optical mechanism for light trapping (bottom).

Content:

Organic photovoltaics (OPVs) are expected as low-cost power generation devices for the near future. To improve the performance of OPVs, we address the light management with moth eye surface, which is a periodic array of cones with the height of several hundred nanometers. We have developed a simulation method to analyze the 3-dimensional optical flow within the OPV cell. By applying this method to design moth eye structure, we have attained 8.3% relative increase in the solar cell efficiency. In the developed device, the incident light can be bent by the moth eye and efficiently trapped within the photoactive layer. This can prolong the length of optical path passing though the active layer, promoting light absorption. The moth eye has been fabricated by nanoimprint lithography, which is adequate for producing large-area nanostructures cost effectively.

Appealing point:

We are studying light management of OPVs from both computational and experimental approaches. We are willing to collaborate with other researchers and companies.

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