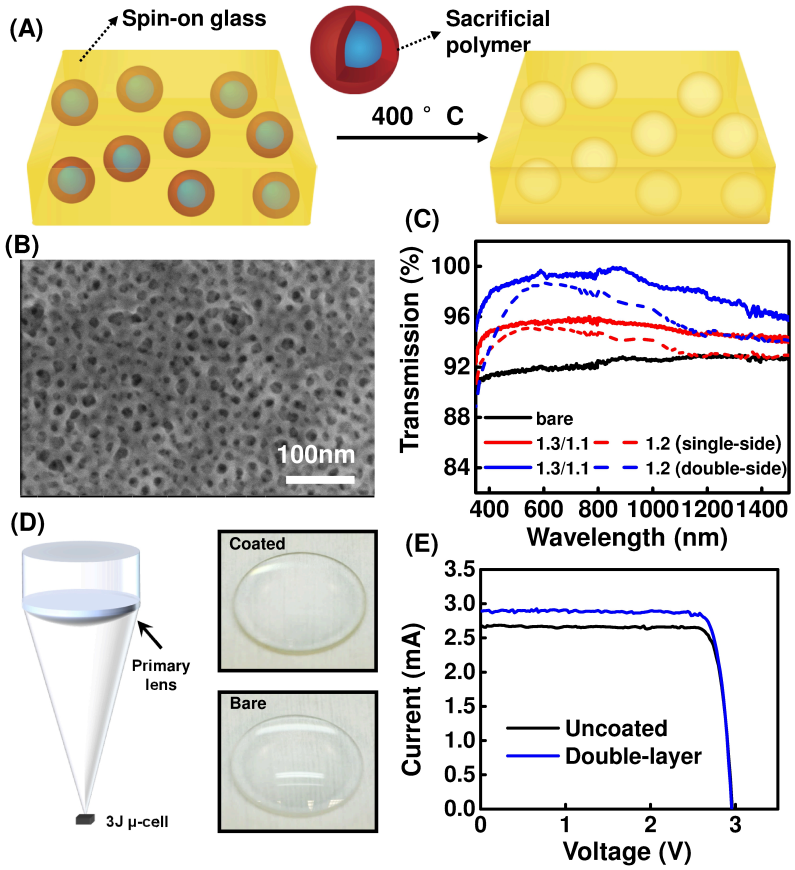
Broadband and Omnidirectional AR Coatings for CPV

April 2017 Research Highlight



(A) Coating fabrication; (B) SEM image; (C) Transmission enhancements; (D) CPV setup and optical images of coated and bare lenses; (E) IV curves showing CPV performance enhancement.

Work was performed at UIUC and Caltech

Scientific Achievement

Broadband and angle-insensitive anti-reflection (AR) coatings that rely on porous nanomaterials are formed on curved lens surfaces by self-assembly.

Significance and Impact

The application of optimized bilayer coatings onto lenses within a concentration photovoltaics (CPV) architecture improved their power output by 8.2%.

Research Details

- Sacrificial polymer components self-assemble into spheres in a spin-on glass matrix, which are then removed in a thermal process that transforms the matrix into a nanoporous structure with reduced refractive index
- The index can be easily tuned by polymer loading, and multilayer coatings can be created on flat/curved glass surfaces to significantly reduce Fresnel reflection losses
- Much easier to be fabricated on glass compared to bio-inspired moth eye structures

Y. Yao, K.-T. Lee, X. Sheng, N. A. Batara, N. Hong, J. He, L. Xu, M. M. Hussain, H. A. Atwater, N. S. Lewis, R. G. Nuzzo, J. A. Rogers, *Adv. Energy Mater.* 2017, 1601992