Docket #: S16-418

Broadband, polarization-independent, omnidirectional, metamaterial-based antireflection coating for solar cells

Stanford researchers have developed a new approach to suppress reflection and achieve near-unity light transmission in silicon-based solar cells. This technology can replace traditional anti-reflection coatings with engineered nanostructures manipulating light at the nanoscale. Near-unity transmission of light into the absorbing layer has been demonstrated in a broad range of visible wavelengths for unpolarized light. The average reflection from silicon has been reduced from 35% to less than 3% across the wavelength range 450-750 nm, which can lead to a substantial solar cell efficiency with limited modifications in the device structure and no changes required in the absorbing layer. Compared to other technologies for reducing reflection, this method is lower cost with higher durability.

Figure

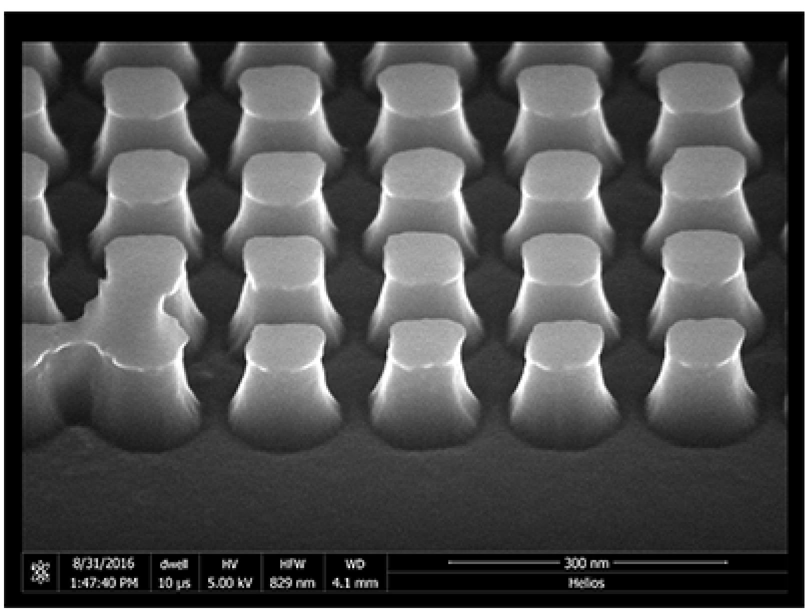

Figure description - SEM image of final nanopillars array

Stage of Research

- Demonstrated for Si, but it can be easily extended to any material, including glass, GaAs, ZnO
- Continued work to optimize the design procedure and further lower the average reflectivity

Applications

- Solar cell devices, Light detectors, Image sensors
- Antireflection coatings for windows, mobile devices cover glasses, and light collectors for concentrated solar power systems

Advantages

- Easy design
- Lower cost
- Higher durability and efficiency
- Broadband
- Controllable (450-750nm)
- Works with any given material in any wavelength range
- No need to grow or develop new materials (integrated solution)
- Flexible: can be customized based on application-specific spectral needs ?
- Works for any incident angle (dispersed light)

Patents

- Published Application: WO2018175874
- Issued: 11,467,495 (USA)

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