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Optimization of TiO2/SiO2 Nanorod Multilayers for High Angle of Incidence Anti-Reflection Coatings for Solar Cells[1] RANGA JAYASINGHE, A.G. UNIL PERERA, Georgia State University, YIPING ZHAO, University of Georgia — Conventional single-layer antireflection (AR) coatings work only at a single wavelength and at normal incidence. However, use of graded-index coatings having multi-layers yield omnidirectional, broadband antireflection characteristics. This will eliminate the need for sun tracking while maintaining high quantum efficiencies. Recent developments in growth of TiO_2 and SiO_2 nanostructures deposited by oblique angle deposition have shown very low refractive indices close to air. Fabry-Perot (FP) interference from the multilayer AR coating structure plays a major role in light transmitted at particular wavelengths. Depending on the thickness and refractive index of the layers, the overall reflection and transmission will get increased or reduced at certain wavelengths due to constructive and destructive interference from multiple reflections. It is possible to fine tune the thickness of each layer and the number of layers to minimize the overall reflection by enhancing destructive interference in the multilayer structure. This work demonstrates the FP oscillator behavior over a broad visible to infrared spectral range with incident angles up to 60 degrees in order to minimize the variations in the reflection and maximize the transmission up to 98.5 %.

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