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Publication date: 2015

Document Version
Publisher's PDF, also known as Version of record

Simulation and Measurement of Angle Resolved Reflectance from Black Si Surfaces

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Simulated reflectance as function of incident angle at a wavelength of 550 nm for surfaces with nanostructures of 300 nm in height in case of (a) linearly graded refractive index and (b) non-linearly graded refractive index. The insets in (a) and (b) show the simulated reflectance at incident angles of 0-70\(^\circ\). The non-linear profile yields the lowest reflectance; below 1\% for angles up to 45\(^\circ\).

Conclusion
Angle-resolved reflectance from nanostructured Si surfaces realized by maskless RIE texturing has been simulated and measured. In both simulation and experiment the specular reflectance is below 10\% at incident angles below 65\(^\circ\) and below 1\% at incident angles below 45\(^\circ\) in the case of non-linear graded refractive index. From the simulation results the non-linear graded refractive index yields lower reflectance than the linearly graded refractive index.

Experimental Results

Experimental specular and total reflectance as a function of incident angle. The average reflectance in the wavelength range 300-1000 nm and the value at a wavelength of 550 nm are shown (left). The specular reflectance at incident angles from 50-85\(^\circ\) is shown to the right.