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Nanostructured solar cells[1] OZGUR YAVUZCETIN, CHEOL-SOO YANG, TOM RUSSELL, MARK TUOMINEN, University of Massachusettts —
In this work we investigate the use of nanofabrication technique to improve the overall efficiency of silicon solar cells. The efficiency and the durability of silicon solar cells largely depends on the quality of the anti-reflectivecoating. In this work, the change in the index of refraction on the surface of a substrate can be controlled by the amount of porosity, which is well known in effective medium theory. Also by changing the thickness of the porous layer, the medium can be fine tuned to a specific wavelength as an AR coating. We fabricate the nanoporous layer by using a self-assembled P(S-b-MMA) coating as a mask to etch into the silicon substrate using reactive ion etching. The use of different molecular weight diblock copolymer and different etching time allow us to tune the index of refraction. FT-IR and variable angle ellipsometry provide information about the transmission and reflection properties along with the index of refraction and the thickness of the coating. The investigation of the efficiencies are performed by comparing the I-V plots of conventional and nanostructured cells. Additional research is underway in order to apply this technology to other types of substrates.

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