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Verifying field-effect passivation of a SiN_x layer on a silicon nanopillar array using surface photovoltage characterization EUNAH KIM, YUNAE CHO, AHRUM SOHN, DONG-WOOK KIM, Ewha Womans University, HYEONG-HO PARK, Korea Advanced Nanofab Center, JOONDONG KIM, Incheon National University — In silicon (Si) wafer based photovoltaic (PV) devices, light-trapping strategies to improve optical absorption are very important due to the indirect bandgap of Si. Surface nano-patterned Si enable omnidirectional broadband antireflection (AR) effects with the help of graded refractive index, multiple scattering, diffraction, and Mie resonance. In this work, the surface photovoltage (SPV) of periodic nanopillar (NP) arrays were investigated using Kelvin probe force microscopy (KPFM). The SPV characteristics clearly revealed that positive fixed charges in SiN_x layers induced downward band bending at the Si surface and increased SPV at the NP top surface. The similar SPV value of NPs and planar counterpart suggests that field effect passivation by the dielectric layer coating could help improve PV performance of nanostructure-based Si solar cells and that KPFM measurements are useful tool for quantitative investigation of surface electrical properties of Si nanostructures.

Yunae Cho
Ewha Womans University

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