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Structural, optoelectronic and antireflective characteristics of texturized-porous silicon for solar cell applications

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Abstract:

Reduction of optical losses in both mono and multicrystalline silicon solar cells by surface texturing is one of the important issues of modern silicon photovoltaics. In this work we report on the texturization of the silicon wafer by means of mechanical grooving [1,2]. A proper optimization of texture appears to be important for the best performance of the solar cells. Combination of texturization-porous silicon nanostructure surface treatment was found to be an attractive technical solution for lowering the reflectivity and passivate the surfaces of mono and multicrystalline silicon [3-6]. Characterizations of untreated and porous silicon-treated mechanically textured surface are performed by Scanning Electron Microscopes (SEM), Nicolet Fourier Transform Infrared (FTIR) spectrometer, PerkinElmer Lambda 950 spectrophotometer equipped with an integrating and WCT-120 Silicon Wafer Lifetime Tester. As a result of the surface treatment, the total reflectivity drops to about 3 % in the 400-1000 nm wavelength range and the effective minority carrier lifetime enhances from 2 µs to about 76 µs after texturization-porous silicon nanostructure combination.

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