Morphological Characterization and Optimisation of Porous Silicon Films for Photovoltaic Application

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Abstract

The growth of needs in energy comes along by a strong greenhouse gases emission. The excess of these gases has a harmful effect on the life on earth. In the perspective to satisfy the increasing demand in energy, without altered our environment, it is indispensable to make recourse to clean and renewable energies. Solar energy is one of the most promising renewable energies sources. Photovoltaic electricity is obtained by direct transformation of sun light to electricity by means of solar cell. To improve solar cells performances as avoiding uses of complex technological process, we resorted to the creation of porous layers on the front surface with the aim of reducing its reflection losses. In this work, morphological characterization of porous silicon films prepared on N and P types silicon wafers having various crystallographic orientations. SEM characterisation show that, surface morphology of porous silicon depends on crystallographic orientation of silicon substrate. In N (100) substrate type the obtained pores have a circular section that becomes square in depth. For N (111) substrate the obtained pores are triangular. In the other hand, simulation optimization of the optical behavior of porous silicon film with graded refractive index, reduce weighted reflectance (Rw) till to 1.64 % and improve photogenerated current more than 51%.

Keywords
Porous silicon, Morphological characterization, Solar energy