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THE EFFECT OF ETCHING CURRENT ON THE FORMATION OF ANTIREFLECTION POROUS SILICON COATING FABRICATED BY ELECTROCHEMICAL TECHNIQUE FOR SOLAR CELLS

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ABSTRACT

The Effect of different etching current densities on the formation of antireflection porous silicon coating used for Solar Cells industry has been investigated. The results show that both the initial surface morphologies and the anodizing etching condition affected on photoluminescence (PL) and the reflectance of the resulting surface. Large number of pores uniformly distributed on overall surface with average pore diameter from 5.80 to 6.20 nm was observed. The vertices of the straight pyramids of the textured Si wafers are etched away during the electrochemical etching and frustums of the pyramids are formed. The pyramid frustums contain nanopores. The PL intensity increases and the PL peak shows a blue shift that could be related to the quantum size effect (QSE) due to the thinning of filaments by the oxidation process. However, for further increase in etching current density, the PL intensity decreases and PL peak shows a red shift. The explanation of this peak shifts of PL emission of porous silicon (PS) samples is given by type of model, is quantum confinement luminescent center (QCLC) model. The energy band gap values were obtained in terms of optical absorption. The values of the optical energy band gaps, which calculated from the reflectance measurements for direct model transition has a good agreement with the values, which calculated from the PL spectrum. These results confirm that PS has a quasidirect band gap. The PS layers formation on the textured surface presents a significant decrease in the effective reflectance. The surface chemical state of porous silicon was investigated by using IR which is a powerful and an easy-to-use technique. The basic features begin from the knowledge of the bonding to hydrogen, Si-H, and the bonding to oxygen, Si-O.

KEYWORDS: Electrochemical Etching, Porous Silicon, SEM, PL, Absorbance, FTIR, Energy Band Gap, Antireflection Coatings, solar Cell

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