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INCREASE PHOTOCELL EFFICIENCY PASSIVATION OF SILICON SURFACE BY A TRANSPARENT CONDUCTIVE COATING BASED ON TIN OXIDE

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Texturing silicon wafers is an effective way to reduce internal light reflection. Passivation of surface by deposition of thin films reduces the probability of charge recombination on dangling bonds. A transparent conductive coating based on SnO2 obtained by the sol-gel method, due to the mild conditions of solution chemistry, provides the formation of a film without appearance of other tin oxides [1,2].

The purpose of this work was to determine the modes of applying a tin oxide coating on the textured surface of silicon wafers to increase the absorption of the sample.

The initial substrate had different surface defects, which is associated with different treatment times in acids during texturization and etching. Samples: A-56 – an untextured silicon, T-46 – with uneven distribution of pyramids, T-30 –with uniform distribution of pyramids on the surface.

Equally important is the dependence of the optical parameters on the number of applied coating films. It can be seen from the spectra of Fig. 1 that with an increase the number of layers from 5-15 for the T-30 sample, the absorption coefficient increases, while the reflection decreases, and the light transmission remains almost unchanged. In this case, the probability of the formation of electron-hole pairs increases. It is noticeable that when applying 15 layers, the maximum increase in the absorption coefficient occurs, then this parameter decreases. A similar trend is noticeable when measuring resistivity. Further increase in the number of applied layers (more than 20) will increase the absorption of light.

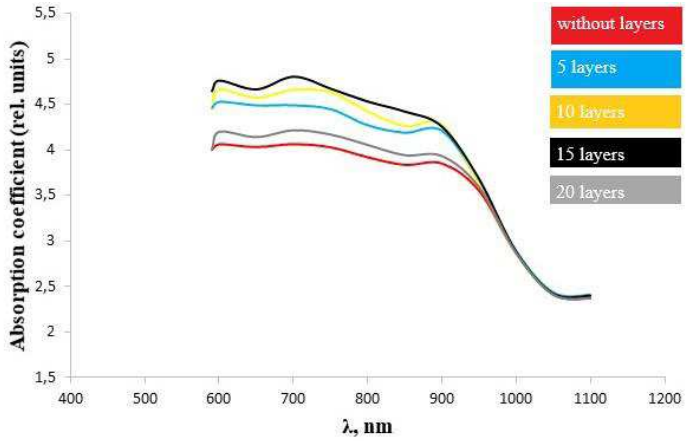

Fig.1. Optical characteristics depending on the number of applied coating layers (Sample T-30)

Changes in the specific surface area of the sample effects on the absorption of light. Analysis by adsorption and desorption methods allow to estimate this parameter. The coating of 5 and 10 layers is deposited on the surface of the plate in the form of separate spherical and filamentous formations. Thus, the surface already developed by texturing increases its inhomogeneity. It is known that such a surface absorbs lighter than a smooth surface. To reduce light reflection, surface morphology textured with coating particles. The reason increasing light absorption at T-30 sample is applying from 5 to 15 coating layers increased the specific surface area (Fig. 2). A further decrease in the absorption coefficient is associated with a decrease in the surface area.

REFERENCES

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