Passivation Properties of Nanostructured SiC Films on Silicon

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In order to reduce the recombination and optical losses in silicon solar cells special passivation layers are applied on their front surface. These layers reduce the effective surface recombination velocity S_{ef}. In the work the passivation properties of nanostructured SiC/Si heterojunctions were experimentally investigated. The SiC films were formed on the front surface of silicon substrate using direct ion deposition method [1].

The thickness of the SiC film on Si substrates varied in the range from 0.1 to 4 μm. The structure and composition of nanostructured SiC films varied in a controlled manner. We investigated the spectral dependence of short circuit photocurrent and open circuit voltage of samples nc-3C-SiC, (-3C-SiC) 80% + nc-Si (~10%), (nc-3C-SiC, nc-21R-SiC) 80%+nc-Si (~10%), (nc-3C-SiC, nc-21R-SiC) 80%+nc-Si (~10%) and (nc-3C-SiC) 70%+nc-Si (~20%) with inclusions of amorphous phase.

The photocurrent and small signal open circuit voltage spectral dependencies at constant monochromatic power mode in the wavelength range 400...1200 nm were measured on the experimental SiC/Si samples.

It was experimentally shown that the effective surface recombination velocity S_{ef} on silicon surface coated with nanostructured SiC film have minimum value in the case using film (-3C-SiC) 80% + nc-Si (~ 10%) annealed in air.

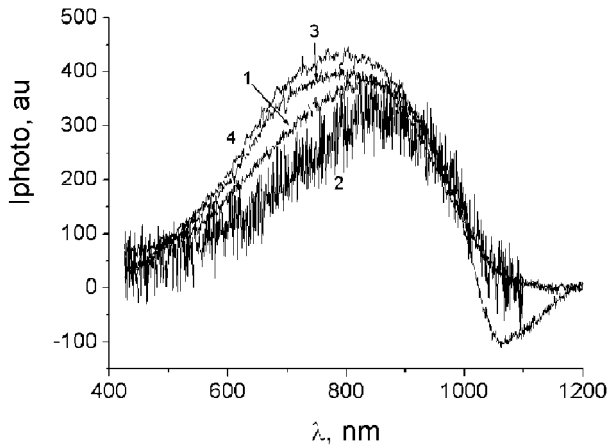

Fig. 1 Experimental spectral dependencies of short circuit photocurrent (1-3) i and open circuit voltage (4) heterojunction SiC/Si samples 7354.10 (1), 7356.10 (2), 7368.10 (3,4).

1. Semenov A.V., Puzikov V.M. at all. Low-temperature fabrication of silicon carbide films of different polytypes. *Semiconductors*, **43**, 5, (2009), 685.