PHOTOEMISSION STUDY OF SiC (0001) SURFACE WITH DEPOSITED Mn ATOMS

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In presented paper the of SiC(0001) surface after sequential coverage by Mn atoms and annealing in Ultra High Vacuum (UHV) was studied. The resonant Photoemission Spectroscopy (RPS) and Atomic Force Microscopy methods were used. The SiC crystal was grown by the seeded physical vapor transport method in the Institute of Electronic Materials Technology at Warsaw [1-2] in quasi-equilibrium conditions with low rate (0.05-0.2 mm/h) deposition on Si (0001) surface of 6H-SiC seeds. The shape and morphology of the crystallization front, defects in crystal and wafers cut of it was presented in the paper [2].

The photoemission data were obtained with the Tunable VUV Photoelectron Spectrometer at the beam line E1 (FLIPPER II) of DORIS storage ring at HASYLAB (Hamburg, Germany). The Energy Distribution Curves (EDCs) of photoemitted electrons were measured for the valence band region and for Si 2*p* and Mn 3*p* core levels. Photoelectrons were analyzed with a double-pass cylindrical mirror analyzer with the resolution about 0.2 eV typically obtained in the experiment. Photon energy $h\nu$ = 130 eV was used to measure Si 2*p* spectra and the region of energy from 48 up to 60 eV was used to measure set of Fano resonances EDC's. In the cleaning procedure in UHV the sample was heated up to 500°C. The obtained results of SiC valence band electronic structure and Si 2*p* band are comparable to presented in papers [3] and [4] relatively. The Mn atoms were sequentially deposited (up to 3 ML) on SiC substrate in room temperature. The annealing of the sample (500°C) with deposited Mn atoms leads to the diffusion of Mn and doping of the crystal surface region.

Deposition of Mn atoms on SiC leads to the change of EDC spectra of SiC valence band. At the valence band edge appears sharp edge corresponding to the Fermi level. These sharp Fermi level edge appears due to creation of metallic islands by the part of the deposited Mn atoms. Other part of deposited Mn atoms (3ML thick) create remarkable changes as well in the spectra of the valence band. The structure appears due to creation of Mn, Si and C atoms chemical compounds in the SiC\Mn interface region. Due to annealing of the sample in temperature of 500°C the sharp edge of the Fermi level near completely disappears. These change occurs due to diffusion of Mn into the SiC crystal and possible creation of new chemical compounds. At the same time, after annealing, appears additional structure of the density of states at the valence band region.

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