Nanoobjects microscopy

The key role of the wetting layer in the process of nucleation, evolution, and growth of the GeSi/Si nanoislands

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GeSi/Si nanoislands are formed in pyramid-like and dome-like shape due to lattice mismatch between Si and Ge in 4% during molecular beam epitaxy of Ge on Si (100) substrate.

The study was performed on two specimens. The specimen A 1 was obtained by Ge deposition on Si (100) substrate at the temperature of 700 ^{0}C and the deposition rate of 0.07 Å/sec. The nominal thickness of the Ge layer was 8.7 monolayers (ML). The buffer layer containing 10 at% of Ge with 10 nm thick was grown on the Si (100) substrate on the A 2 specimen before Ge deposition. Germanium film with the nominal thickness of 8 ML was deposited on the buffer layer with the same rate and at the same temperature as the specimen A 1.

Determination of the lateral elemental composition distribution on the GeSi/ Si nanoislands surface as well as depth profiling was performed using scanning Auger microscopy. The lateral size of the analysed area can reach down to 3 – 5 nm and Auger-electron escape depth is about 1 nm.

It is important to solve the problem of the thermal drift correction for obtaining of the lateral elemental composition distribution maps. The procedure of correct layer-by-layer ion etching which minimizes etching effects was developed for obtaining the depth profiles.

The lateral elemental composition distribution maps were registered at some depths during dome profiling. 3D elemental composition distribution in the dome bulk was constructed by the interpolation of the obtained data.

It is easy to reach a conclusion of a key role of the wetting layer in the process of nucleation, evolution, and growth of the GeSi/Si nanoislands after analyzing of depth profiles registered on the surface of the wetting layer, pyramid, and dome on A 1 and A 2 specimens.

1. *Ponomaryov S. S., Yukhymchuk V. O., Lytvyn P. M., Valakh M. Ya.* Direct Determination of 3D Distribution of Elemental Composition in Single Semiconductor Nanoislands by Scanning Auger Microscopy // Nanoscale Research Letters-2016-**11**-103.-P. 1-13.