BISMUTH GROWTH ON Ge(111): EVOLUTION OF MORPHOLOGICAL CHANGES FROM NANOCRYSTALS TO FILMS

A. Goriachko[1], *A. Shchyrba*[1,2], *P.V. Melnik*[1], *M.G. Nakhodkin*[1]

[1]Faculty of Radiophysics,
Taras Shevchenko National University of Kyiv
(*4g, Glushkova Ave., Kyiv 03022, Ukraine;*
e-mail: andreandy2000@gmail.com),
[2]Department of Physics, University of Basel
(*4056 Basel, Switzerland*)

S u m m a r y

The growth of ultra-thin bismuth films up to 15 atomic layers on the atomically clean Ge(111)-c(2×8) substrate at 300 K is investigated before and after the annealing at 450 K by means of ultra-high vacuum scanning tunneling microscopy. The whole range of morphologies is observed for the Bi adsorbate such as individual atoms, two-dimensional nanoislands, three-dimensional nanocrystals and microcrystals, as well as an atomically flat film. The 3D nanostructuring is achieved through the Vollmer–Weber growth mode up to 10 atomic layers, followed by film's flattening from 10 to 15 atomic layers. Annealed submonolayer films display individual Bi atoms incorporated into the uppermost atomic layer of Ge(111), as well as two-dimensional nanoislands of the first layer (2D nanostructuring). Thicker films display the coarsening after the annealing, compared to the as-deposited specimen, containing a diversity from nano- to microcrystals of bismuth.