Nanostructured surfaces

Growth of epitaxial Bi-films on vicinal Si(111)

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The semi-metal bismuth reveals intriguing physical properties compared to conventional metal which partly even resemble topological insulators. Surface states, e.g., are much more conductive than bulk states, which become readily insulating due to quantum confinement in nano-sized structures. The spin-orbit coupling in Bi is evident from pronounced Rashba-splitting of the surface states, which gives rise to spin-polarized transport. Vicinal Bi(111) surfaces reveal further attractive features, e.g., one-dimensional and spin-split electronic states [1]. *These edge states have been characterized so far only spectroscopically but for their probing by transport, controlled epitaxial growth of vicinal Bi-films is mandatory.*

In this study [2] the growth of Bi-multilayer structures on Si(557) substrates has been investigated by low energy electron diffraction. Thereby, *wetting layer structures formed prior to the film deposition on Si(557) surfaces turned out to be crucial for epitaxial growth*. Only in the presence of Bi-wetting layers can well-ordered films can be grown. In contrast to growth on Si(111), the pseudo-cubic surface of Bi(110) dominates. In addition, Bi(221) surfaces have been obtained only on wetting layers formed by less than a monolayer. The formation of Si(335)-facets during formation of the wetting layers turns out to be essential for the growth of the these structures.

1. *Wells J.W., Dil J.H., Meier F., Lobo-Checa J., Petrov V.N., Osterwalder J., Ugeda M.M., Fernandez-Torrente I., Pascual J.I., Rienks E.D.L., Jensen M.F., Hofmann P* Nondegenerate Metallic States on Bi(114): A One-Dimensional Topological Metal // Phys. Rev.Lett. - 2009.- **102**, -P. 096802(4).
2. *Lükermann D, Banyoudeh S., Brand C., Sologub S, Pfnür H., Tegenkamp C.* Growth of epitaxial Bi-films on vicinal Si(111) // Surf. Sci. - 2014.-**621**, -P. 82-87.