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Investigation of broken symmetry of Sb/Cu(111) surface alloys by VT- STM

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<p>The adsorption of Sb on the (111) plane of noble metals surfaces such as copper and silver has long been of practical interest in the fields of surface science and technology. The electronic properties of such surface alloys are important for several surface and interface related applications like metal-metal or semiconductor-metal heteroepitaxy, heterogeneous catalysis, sensors and spintronics applications. The structure of these monolayers on metal substrates is a complex interplay of electronic, stress and geometric effects, all related to each other. Theoretical calculations have suggested that the energetics of the Sb/Cu(111) system are such that in the ordered 0.33 ML Cu(111) (√3x√3) R30°-Sb phase the Sb atoms substitute one-third of the outermost Cu atoms to produce an ordered surface alloy after annealing. Due to its ability to act as a surfactant (low surface energy), Sb segregates from the bulk of the substrate to remain on the surface, thus forming a surface alloy. This work present an in situ Variable Temperature Scanning Tunneling Microscopy (VT-STM) study of the segregation and dissolution kinetics of Sb/Cu(111) studied at various temperatures. The study shows the growth mechanism of Sb mediated by the kinetics and thermodynamics at the substrate surface. After deposition of 0.3 ML Sb on a clean Cu(111) surface, STM images exhibit Sb atoms as bright spots surrounded by six copper atoms at the surface with perturbed atomic positions resulting in a broken structural inversion symmetry at the surface.. The atomic arrangements of Sb remain stable during several STM scans.

Level (Hons, MSc,
   PhD, other)?

PhD

Consider for a student
   award (Yes / No)?

Yes

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

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