

Electronic and atomic structures of Au-adsorbed Ge(001) and (111) surfaces

Fumio Komori

Institute for Solid State Physics, the University of Tokyo

Electronic and structures of the Ge(001) and (111) surfaces with Au are studied by scanning tunneling microscopy (STM) and angle-resolved photoemission spectroscopy (ARPES). The Au-adsorbed Ge(001) surface shows a chain structure and a metallic surface band. Thus, Peierls transition and/or Luttinger liquid behaviors have been expected and claimed. [1] We show the metallic surface band is two dimensional and the dispersion is steep in the direction perpendicular to the surface chain direction. [2] The Au-adsorbed Ge(111) surface has two two-dimensional surface metallic bands; one is electron-like and the other is hole-like. The electron band originates from Au trimers of a conjugate honeycomb chained trimer (CHCT) model at the surface, and splits anisotropically into two bands because of the strong spin-orbit interaction (Rashba effect). The hole band originates from the subsurface Ge atoms, and gives a honeycomb STM image in a limited bias-voltage range. A triangle structure mobile at room temperature selectively dopes the electron-like surface metallic band. [3]

1. Debate, for example, K. Nakatsuji and F. Komori, *Nature Physics* **8** (2012) 174.
2. Kan Nakatsuji *et. al.*, *Phys. Rev.* **B84** (2011) 115411.
3. Kan Nakatsuji, *et. al.*, *J. Phys. Condens. Matter* **25** (2013) 045007.