**Exotic phenomena of atomic wires on semiconductor surfaces**

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One-dimensional (1D) electronic systems have attracted considerable interest on account of exotic phenomena such as Peierls instability and Tomonaga-Luttinger liquid. In order to investigate such 1D phenomena in a real system, electrons need to be delocalized along only a specific direction. This is observed as highly-dispersive 1D energy bands in angle-resolved photoemission spectroscopy. There have been few 1D structures with highly-dispersive 1D bands because it is not guaranteed that all 1D structures have sufficient electron delocalization.

Recently few 1D structures with highly-dispersive bands were observed on Si surfaces: the In/Si(111)-4x1 Surface and the Au/Si(111)-5x2 surface. The three 1D metallic bands of the In/Si(111)-4x1 surface are related to interesting phenomena such as 1D charge density wave (CDW) formation, interband interactions within multiple metallic bands, and the coexistence of metallic and CDW phases. The Au/Si(111)-5x2 surface with 1D bands was reported to show a continuous transition in dimensionality as well as a novel local electronic structure of a disordered 1D metallic system. More recently, stepped Si surfaces have been used to provide various 1D structures. The Au adsorption on stepped Si surfaces, Si(557)-Au and Si(553)-Au, were found to produce multiple 1D metallic bands, where the number and band fillings of the 1D bands depend on the substrates. These systems have exhibited interesting phenomena such as the Peierls instability on the Si(557)-Au surface, the coexistence of x2 and x3 Peierls distortions within a single unit wire on the Si(553)-Au surface, and spin-orbit-split 1D metallic bands.

In this presentation, I will focus on the detailed 1D electronic structures of In atomic wires on the In/Si(111) surface and Au and Si atomic wires on the Au/Si(553) and Au/Si(557) surfaces. The mechanisms of the metal-insulator transitions of the atomic wires will be also discussed. In addition, I will introduce new atomic wires grown on the Si(557) surface.