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Low-Dimensional Materials, 2D Topological Insulators, Scanning Tunneling Microscopy/Spectroscopy

"Low-Dimensional Quantum Materials Physics Laboratory" is a joint lab with Kyoto University, focusing on the investigation of structures and electronic properties inside low-dimensional materials by Scanning Tunneling Microscopy/Spectroscopy (STM/S). Since low-dimensional quantum materials have become promising materials for next generation devices, to characterize them is an important issue. We now have a Low-Temperature High-Magnetic-Field to study such as Silicene (Si version graphene), Layered Bismuth, and Transition Metal Dichalcogenides (TMDs). For example, **Fig. 1** shows the Quantum Hall Effect (QHE) measurement for a single layer silicene. The atomic structure can also simultaneously be observed as the insert image. **Fig. 2** shows topological edge states of layered Bi grown on Si(111) observed by quasiparticle interference (QPI). **Fig. 3** shows a break junction measurement by STM. The one dimensional edge state of silicene nanoribbon (SiNR) is clearly revealed while it's lifted up by the STM tip.

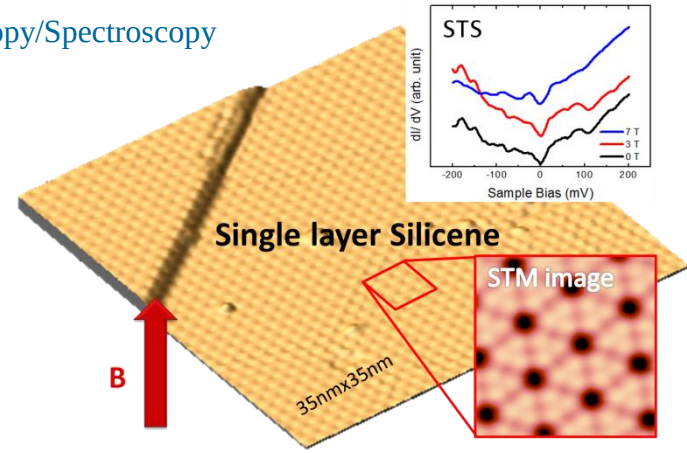

Figure 1 QHE measurement of a single layer silicene.

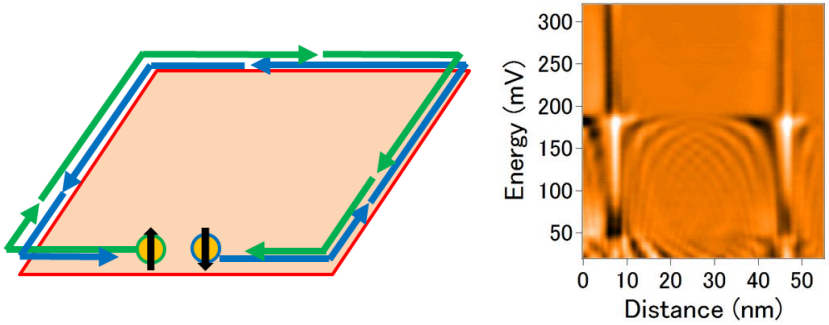

Figure 2 Topological edge states of layered Bi observed by STM

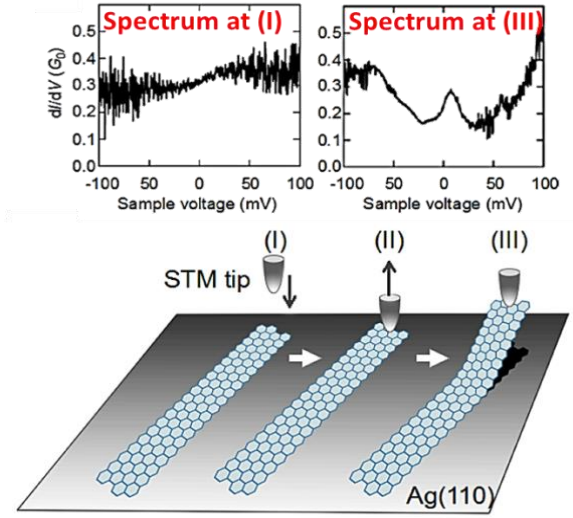

Figure 3 Break junction measurements of SiNR carried our by STM