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**The atomic structure of high-index Si surfaces:
Si(5 5 12) and its potential applications**

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It is expected that the current electronic devices will be replaced by the quantum devices in twenty years. Hence, in addition to the race of device miniaturization, the related novel phenomena in the nanoscale structure is inevitable subjects for the scientists to encounter. Among them, the quantum confinement of charge carriers in one dimensional nanostructure is one of the interesting topics. Then, it is a pre-requisite condition to prepare a well-defined and homogeneous one-dimensional wire.

Therefore, in the present study, a high-index Si(5 5 12) surface has been employed as a template to fabricate such a qualified wire in the self-assembled manner, since the clean and reconstructed Si(5 5 12)-2x1 is known to have a single-domain and one dimensional symmetric structure. Firstly, using the scanning tunneling microscopy, the detailed atomic structure of Si(5 5 12) has been clarified. Especially, the ad-dimer, which is a unique indicator residing between the dimer chain and the π -7 chain, has been utilized. Secondly, since the reconstruction of Si(5 5 12)-2x1 is easily affected by the strain and the stress, it is not easy to prepare the wide terrace, which is critical condition in achieving the wire with high aspect ratio. At the same time, another parasitic reconstructions in Si(5 5 12) surface, like a Si(7 7 17)-2x1 domain and a mesofacet Si(1 1 3) have been studied. Lastly, as an example of self-assembled nanowire on the Si(5 5 12) template, Ag nanowire was tested. It has been concluded that the site-selective reaction of Ag atom enables this high-index surface to be an excellent template for growing one dimensional nanofeature.