Geometric and Electronic Structure of Ni Silicide on Si(100)

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It is now understood that $NiSi_2/Si(111)$ is a model system in which the Schottky barrier heights is determined by the atomic structure of the interface. In $NiSi_2/Si(100)$ system, the measured Schottky barrier heights were reported to be depending on how the sample was prepared.

We have studied this system by using scanning tunneling microscope/spectroscopy and tunneling electron interferometry. Besides the previously reported (1×1)-$NiSi_2$ phase by TEM and STM, phases such as (2×1)-NiSi, $(\sqrt{2}\times\sqrt{2})$-R45° and (111) facet growth have been observed under various growing conditions. We'll suggest the model for (1×1) phase structure, in which we'll argue the inverse-pyramidal patch structure with stacking fault. The (111) facet grown island has the pyramidal shape. This structure has been discussed in conjunction with the energetics. The multiple phases are due to several local minima in the interfacial phase diagram as suggested by the theoretical calculation. By measuring the differential conductivity in a Fowler-Nordheim regime, the structure of Ni/Si interface was imaged together with the topography.