

What about U in surface adatom systems? - Interplay of charge and spin degrees of freedom

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We study the interplay of charge and spin degrees of freedom in surface adatom system X: Si(111) with X = C, Si, Sn, Pb.

The monolayer of adatom on Si(111) forms triangular lattice.

Given a single-band character of the system, X: Si(111) is an ideal playground for studying correlation effect in 2D system.

Despite much effort, there is still a controversy on which (spin or charge) instability is dominant.

Furthermore, there seems a contradiction in experimental results depending on the probe. For example, for Sn: Si(111), the ARPES and core-level spectroscopy see a signature of ordering. On the other hand, the STM sees no signature of ordering.

We use a new method, so called TRILEX, to attack the interplay between charge and spin degrees of freedom.

TRILEX can treat spin and charge degrees of freedom on same footing.

We show that the system is in an interesting regime which is close to the boundary between charge- and spin-dominant regimes.

We also discuss that the time scale of the probe is important in understanding the experimental result:

While fast probe like ARPES and core-level spectroscopy sees a snapshot, the slow probe like STM measures time-averaged quantities.

This is why fast probes see a signature of ordering, while slow probes do not.