Temperature dependent ARPES studies of Sr_2RuO_4

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Discovery of spin triplet superconductivity in Sr_2RuO_4 brought attention to the electronic structure studies on the system, especially by using angle resolved photoemission (ARPES). There are three bands that cross the Fermi level. The system is particularly interesting because these bands have different orbitals with different characters such as dimensionality. Along the way, it was found that there are surface states due to RuO_6 octahedral rotation on the surface layer, which results in a dramatic change in the electronic structure.

So far, only static properties of Sr_2RuO_4 have been studied by ARPES. To investigate the dynamic properties of Sr_2RuO_4 in the electronic structure, we have performed temperature dependent ARPES studies on Sr_2RuO_4 as well as LEED IV experiments. We found that there is very strong temperature dependence in the surface electronic structures. While 10K data show very strong surface states, raising temperature practically kills the surface state signal (figure 1). Surprisingly, the states are recovered when the samples are cooled back down to lower temperature.

To investigate the possible role of the structural change, we performed temperature dependent LEED IV experiment. The indication is that there is not much structural change in the surface atomic structure. This suggest that disappearance of the surface ARPES signal comes from dynamic fluctuation in the octahedral rotation. We will discuss the result in terms of possible quantum critical point.

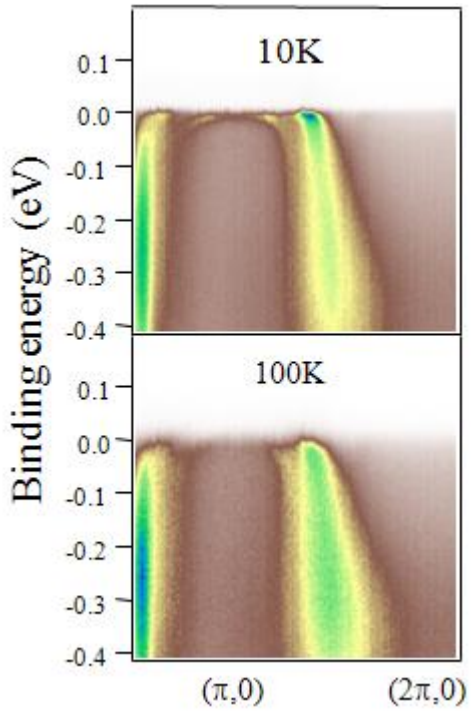

Fig. 1. Temperature dependent ARPES data from Sr_2RuO_4. The flat band near (π,0) is from the surface states.