

## Local Effect of $\sqrt{13} \times \sqrt{13}$ Reconstruction on Single-layer FeSe/ SrTiO<sub>3</sub>

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Monolayer iron selenide (ML FeSe) on strontium titanate (SrTiO<sub>3</sub>, STO) is a superconductor with  $T_c$  over 60K [1], in which the STO substrate is said to play an important role in the high- $T_c$  superconductivity. According to our previous research, the superconducting gap size as well as the doping level of ML FeSe changed by employing different STO surface superstructures [2]. However, it is still unclear how the electronic structure of ML FeSe is affected locally within the same STO surface reconstruction. Since the reported STO surface periodicity is relatively large compared to FeSe, it can be imagined that the STO atomic structure may locally influence the grown FeSe.

Thus, in the present study, we use low-temperature (5K) scanning tunneling microscopy/spectroscopy (STM/STS) to measure the correlation between the surface structure and the electronic state as well as the superconductivity of ML FeSe/ STO -  $\sqrt{13} \times \sqrt{13}$ .

In the atomically resolved STM image such as the one shown in Fig. 1, we observed some local characteristics that can be classified into the following three features:

- 1)  $1 \times 1$  only area that shows that the ML FeSe lying on the  $1 \times 1$  STO. The lattice constant of ML FeSe is stretched from the bulk value of 3.76Å to 3.9Å.
- 2) The ‘z’ patterns that arrange in  $\sqrt{13} \times \sqrt{13}$  periods possibly induced by the surface reconstruction of STO -  $\sqrt{13} \times \sqrt{13}$ .
- 3) The dumbbell-like patterns. They should correspond to Se or Fe vacancies at the surface [3,4].

We will discuss the details of each feature as well as the corresponding STS spectra in the presentation.

### References:

- [1] Wang Qing-Yan *et al.*, Chinese Phys. Lett. **29**, 037402 (2012).
- [2] Tomoaki Tanaka *et al.*, Phys. Rev. B **101**, 205421 (2020).
- [3] Chong Liu *et al.*, Phys. Rev. B **97**, 024502 (2018).
- [4] Huimin Zhang *et al.*, Comm. Phys. **3**, 75 (2020).

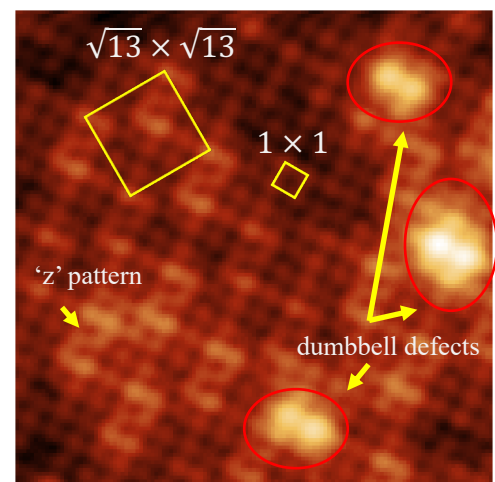


Fig. 1 STM image of ML FeSe/STO -  $\sqrt{13} \times \sqrt{13}$ .

$7.5 \times 7.5 \text{ nm}^2$ , set point: 50mV, 100pA.