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Visualizing the microscopic coexistence of spin density wave and superconductivity in underdoped $NaFe_{1-x}Co_xAs$ PENG CAI, XIAODONG ZHOU, WEI RUAN, Tsinghua University, AIFENG WANG, XIANHUI CHEN, University of Science and Technology of China, DUNG-HAI LEE, University of California at Berkeley, YAYU WANG, Tsinghua University — Although the origin of high Tc superconductivity in the iron pnictides is still under debate, it is widely believed that magnetic interactions or fluctuations play an important role in triggering Cooper pairing. Because of the relevance of magnetism to pairing, the question of whether long range spin magnetic order can coexist with superconductivity microscopically has attracted strong interests. The available experimental methods used to answer this question are either bulk probes or local ones without control of probing position, thus the answers range from mutual exclusion to homogeneous coexistence. In this talk we present STM studies of the local electronic structures of an underdoped $NaFe_{1-x}Co_xAs$ near the spin density wave (SDW) and superconducting (SC) phase boundary. Spatially resolved spectroscopy directly reveal both the SDW and SC gap features at the same atomic location, providing compelling evidence for the microscopic coexistence of the two phases. The strengths of the SDW and SC features are shown to anti correlate with each other, indicating the competition of the two orders. The microscopic coexistence clearly indicates that Cooper pairing occurs when portions of the Fermi surface are already gapped by the SDW order. [1]P. Cai, et al., arxiv:1208.3842(2012)

Peng Cai
Tsinghua University

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