PCP5-2

Electronic phase diagram of $Sr_2V_{1-x}Sc_xFeAsO_3$

*Masamichi Nakajima[1], Taihei Wakimura[1], Shigeki Miyasaka[1], Setsuko Tajima[1]

Osaka University, Japan[1]

In iron-based superconductors, various electronic orders emerge in an iron layer due to intertwined electronic degrees of freedom. Iron-based superconductors with a perovskite-type thick blocking layer, e.g. $Sr_2VFeAsO_3$, offer various possibilities of chemical substitution into the blocking layer, which keeps the iron layer clean, and are suitable for a study to investigate the electronic state in the iron layer. $Sr_2VFeAsO_3$ shows superconductivity, while non-superconducting isostructural counterpart $Sr_2ScFeAsO_3$ exhibits antiferromagnetic ordering [1]. In this work, we synthesized polycrystalline $Sr_2V_{1-x}Sc_xFeAsO_3$ and studied how the electronic state evolves on going from $Sr_2VFeAsO_3$ to $Sr_2ScFeAsO_3$. With increasing Sc content x, a superconducting transition temperature systematically decreases. We revealed that the antiferromagnetic phase shows up for $x > 0.45$ adjacent to the superconducting phase. $Sr_2VFeAsO_3$ shows not only superconductivity but also an enigmatic electronic order at $T_0 \sim 150$ K. The phase transition at T_0 is present up to $x = 0.17$ and disappears with further Sc substitution. The suppression of the transition is slower than the case for Cr substitution [2]. In light of a proposed scenario that the transition at T_0 arises from frustration between stripe-type and Neel-type antiferromagnetic fluctuations of Fe and V spins, respectively [3], the frustration is lifted by non-magnetic Sc substitution at V sites, giving rise to the suppression of the transition.

[1] J. Munevar *et al.*, Phys. Rev. B **84**, 024527 (2011).
[2] T. Wakimura *et al.*, Supercond. Sci. Technol. **32**, 064003 (2019).
[3] J. M. Ok *et al.*, Nat. Commun. **8**, 2167 (2017).

Keywords: Iron-based superconductors, Sr2VFeAsO3, Chemical substitution