

Coupling between Charge Density Wave and Kondo Lattice Behavior in 2D Ferromagnet Fe₅GeTe₂

Ya-Ping Chiu

Department of Physics, National Taiwan University, Taipei 10617, Taiwan

This study investigates the coexistence and coupling of Kondo interactions with charge density wave (CDW) phenomena in the two-dimensional metallic ferromagnet Fe₅GeTe₂ using scanning tunneling microscopy/spectroscopy (STM/STS). Through atomic-resolution STM imaging, we observe a $\sqrt{3} \times \sqrt{3} R30^\circ$ superstructure accompanied by phase inversion, suggesting the emergence of CDW. Concurrently, STS measurements unveil a Fano-like peak near the Fermi level, indicative of Kondo resonance, thereby corroborating the presence of a Kondo lattice. Furthermore, the formation of Kondo holes at defect sites underscores the influence of Kondo interaction on local electronic structures. Subsequent analyses of the CDW modulation unveil a robust correlation between CDW and Kondo lattice behavior. Our experimental results provide direct evidence of the simultaneous stabilization of CDW and Kondo lattice behaviors. These findings not only advance our understanding of Kondo physics in *d*-electron ferromagnetic systems but also highlight Fe₅GeTe₂ as a promising platform for exploring low-dimensional magnetism and spintronics applications.^[1]

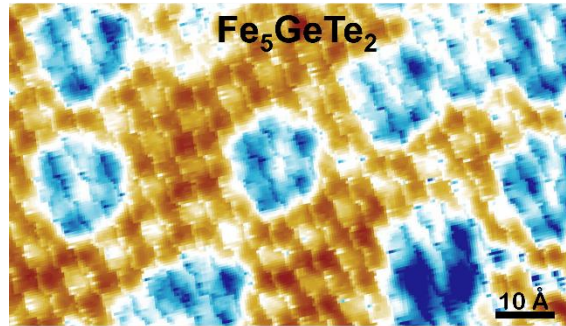


Fig. 1 coherent interplay between Kondo interaction and charge density wave (CDW) phenomena in Fe₅GeTe₂ using scanning tunneling microscopy/spectroscopy.

[1] Pei-Rui Luo, Hung-Chang Hsu, Li-Sheng Lin, Hao-Yu Chen, Xiang-Yu Xie, Chia-Nung Kuo, Jyh-Pin Chou*, Chin-Shan Lue*, Ya-Ping Chiu*, Nature Communications 16, 5080 (2025).