7th International Workshop on 2D Materials

Title of the Presentation: Experimental Observation of Two-Dimensional Superconductivity in Bulk 2H-NbS_2

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Short Biography:

Xiangyu Bi, PhD student at College of Engineering and Applied Sciences, Nanjing University, received his B. S. degree from Nanjing University in 2020. He had two overseas internship experiences at Harvard University and the University of Tokyo during his undergraduate studies. He focused on the research about superconductivity behaviour of van der Waals materials based on electrical transport characterizations since 2018, under the guidance of professor Hongtao Yuan.

Abstract:

The dimensionality of superconductivity is a key issue for the long-range-order phenomena emergent from competitions between condensation and fluctuation. For instance, two-dimensional (2D) superconductivity is strongly related to nontrivial Berezinskii–Kosterlitz–Thouless (BKT) transition, and provides a novel viewpoint to understand the quantum Griffith singularity, Ising pairing, and vortex creep, as well as mechanisms of high-temperature superconductors and other layered superconducting systems. 2D superconductivity has so far been successfully achieved in atomically thin layers, 2D electron gas at interfaces, and artificial superlattices [1-2]. However, it remains elusive whether naturally-formed bulk materials with intrinsic 2D-like superconducting bands are able to show 2D superconductivity behaviour.

Here, we demonstrate that 2D superconductivity behaviour can be observed in bulk 2H-NbS_2 based on experiments for upper critical magnetic field with high-resolution angle-rotator, indicating that the intrinsic 2D-like superconductivity might also exhibit in bulk multi-band superconductor. Our results provide a new perspective to understand band-selective pairing mechanism for 2D superconductivity in van der Waals materials.

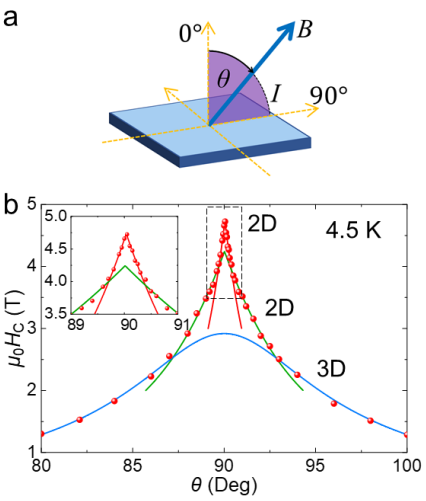

Figure 1. (a) Schematic diagram of characterization geometry. (b) Fitting results of $H_c(\theta)$ at 4.5 K.

[1] Y. Saito *et al*. Nat. Rev. Mat. 2, 16094 (2017).

[2] A. Devarakonda *et al*. Science 370, 231-236 (2020).