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Transport Signatures of Nematic Phase Transition in Pressurized Kagome Superconductor RbV_3Sb_5

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The electronic nematicity has been observed in several unconventional superconductors, where its associated fluctuations are believed to be important for the stabilization of superconductivity and the appearance of non-Fermi liquid behavior [1,2]. However, in most cases, the nematicity is intertwined with other forms of orders, such as antiferromagnetism (AFM) and/or charge density wave (CDW), making it challenging to extract its intrinsic signatures in electrical transport and distinguish its interplay with other orders.

Recently, electronic nematicity beneath an unconventional CDW has been reported in Kagome superconductor AV_3Sb_5 with A = K, Rb, Cs [3,4]. Such a discovery makes AV_3Sb_5 a promising playground for investigating the interplay among nematicity, CDW, and superconductivity. However, to achieve such a scientific goal, experiments with the systematic tuning of AV_3Sb_5 that can probe the intrinsic signatures of nematic phase transition are essentially required.

In this presentation, we will show high-quality transport results on AV_3Sb_5 utilizing the device-integrated diamond anvil cell technique we recently developed. We found that the resistivity of AV_3Sb_5 develops a universal T^3 dependence when entering the nematic phase. Upon pressurization, the T^3 dependence in RbV_3Sb_5 disappears at pc_1, where the first superconducting dome locates. Together with analysis of Kohler scaling on magnetoresistance, normal Hall coefficient, and Shubnikov-de Hass (SdH) quantum oscillations up to 50 kbar, we identified the existence of nematic quantum phase transition under pressure. Our results suggest that the enhancement of superconductivity at pc_1 is closely related to the electronic fluctuation when nematic order is suppressed while the second superconducting dome originates from different mechanisms.

Reference

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