Poster-2-4

Probing the superconducting gap symmetry of infinite-layer nickelates through electron irradiation induced disorder

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Superconducting infinite-layer nickelates saw their experimental realisation two decades after their theoretical prediction [1], generating significant interest for being isoelectronic to $3d^9$ superconducting cuprates. This feat was achieved by combining epitaxial thin film synthesis with topochemical reduction to stabilise the required nickel electronic configuration [2]. While sharing similarities in phase diagrams [3], nickel- and copper-based systems exhibit notable disparities in band structure and hybridisation [4-6].
Determining the superconducting nickelate's pairing symmetry has posed a significant challenge [7], partly due to limitations of thin-film sample geometry and surface degradation during chemical reduction processes [8]. Various techniques to investigate the superconducting order parameter symmetry, including studies of London penetration depth through mutual inductance [9] or tunnel diode oscillator method [10], single-particle tunnelling [11], photoemission spectroscopy [12-14], and thermal transport are challenging to perform or interpret on these chemically reduced thin films.
In addressing this challenge, we employ high-energy electron irradiation to introduce disorder into superconducting nickelate thin films in a controlled manner. By examining the impact of pair-breaking defects on superconductivity, we aim to shed light on the nature of the gap symmetry. Our initial findings show the suppression of superconducting transition temperature and increase of normal state resistivity with induced disorder.

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