Superconductivity in Infinite Layer Nickelates

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The discovery of high-temperature (high-Tc) superconductivity in cuprate four decades ago motivates intense theoretical and experimental efforts to pursue and understand the phenomenon. One of the ideal routes is through a cuprate analogue which mimics the electronic and structural templates of the high-Tc cuprate. Standing beside copper in the periodic table, Ni^{1+} in infinite-layer phase hosts $3d^9$ electronic structure with lifted orbital degeneracy resembles Cu^{2+} state in the cuprate superconductors. Despite more than two decades of theoretical predictions, superconducting infinite-layer nickelate was only successfully synthesized in 2019 in thin film form. Since then, considerable advancements in both theoretical and experimental studies of this newfound long-promise nickelate superconductor have been made. Following the two decades theoretical debates, the recent experimental data suggest both significant similarities and distinctions to the high-Tc cuprate. We will discuss these aspects along with our recent magnetotransport data measured in magnetic fields up to 55 T and at temperature down to 30 mK that shows rare-earth specific Pauli-limit violation in all crystallographic directions, which suggests a richer superconducting landscape in the newfound nickelate beyond a cuprate-like image.