Electronic Band Structure of a Superconducting Nickelate Probed by the Seebeck Coefficient in the Disordered Limit

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Superconducting nickelates are a new family of materials closely resembling the high temperature cuprate superconductors. While analogy between cuprates and nickelates is natural given by the common structural motif of MO_2 (M=Ni,Cu) planes, very little is known about the metallic state of the nickelates, making these comparisons difficult.

Here **users of PARADIM and their collaborators report the first Seebeck coefficient (S) measurements of superconducting nickelates.** The key finding is a temperature-independent and negative ratio S/T for both, the thin-film superconducting five-layer (n = 5) and a thin-film metallic three-layer (n = 3) nickelate. The measured S/T is well described by the band dispersion calculated with density functional theory (DFT), demonstrating the presence of a semi-classical metallic state, similar to that in over-doped cuprates (Bi2201), and distinct from that in optimally doped cuprates (Nd-LSCO).

The study reflects the high elastic scattering limit of the Seebeck coefficient reflects only the underlying band structure of a weakly correlated metal (as computed from DFT), analogous to the high magnetic field limit of the Hall coefficient.

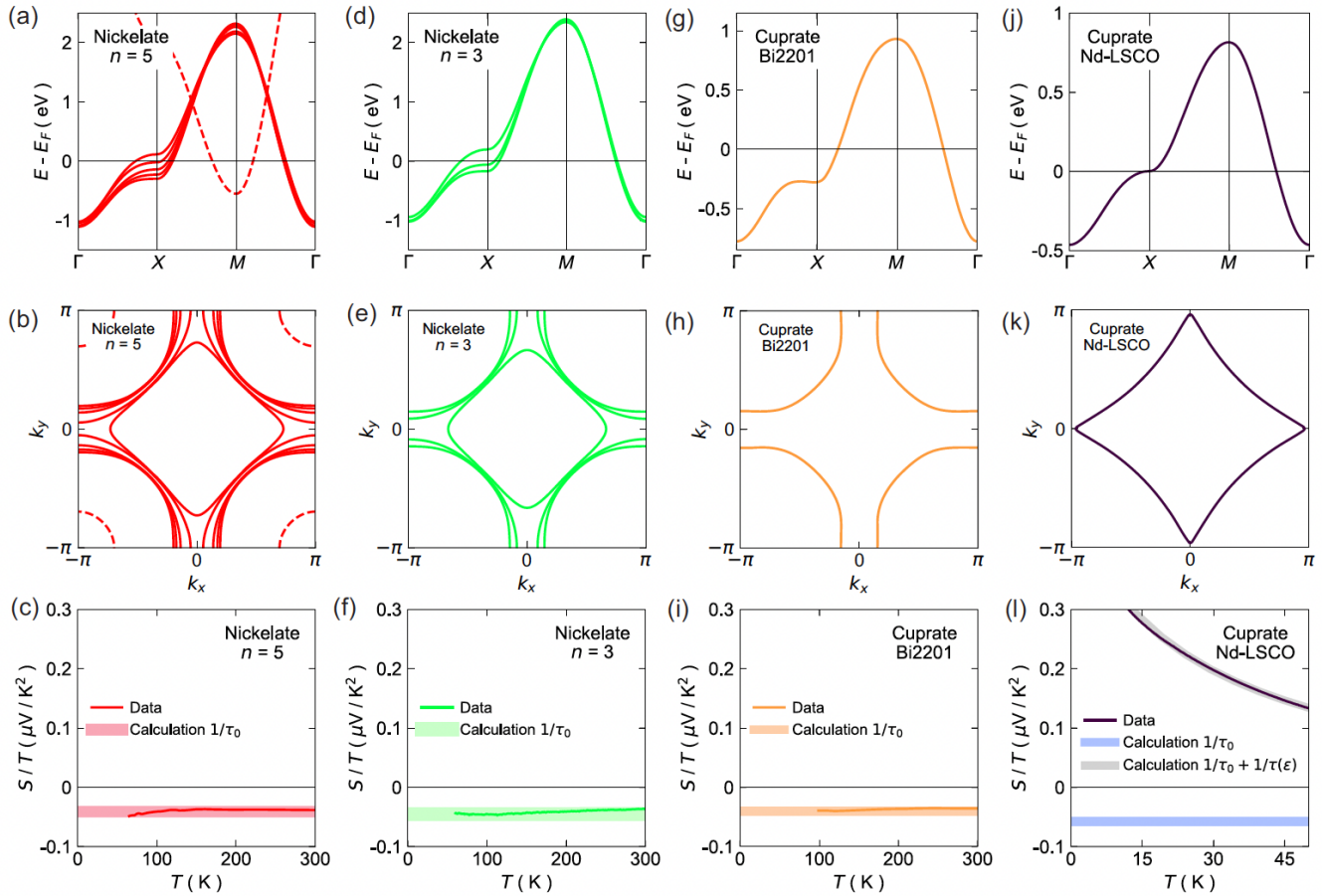

Figure: Electronic band structures (top row), Fermi surfaces (middle row), and Seebeck coefficient (calculated & measured, bottom row) for: n = 5 nickelate (left column), n = 3 nickelate (2nd column), cuprate Bi2201 (3rd column), and cuprate Nd-LSCO (right column).

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