Magnetism-Induced Symmetry Breaking in $YNiO_3$ Across the Néel Transition Revealed by Powder Diffraction

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Recent discoveries of superconductivity in both infinite-layer and Ruddlesden-Popper nickelates have substantially broadened the functional landscape of rare-earth Ni-based compounds, highlighting their capacity to host strongly correlated electronic phases with intertwined magnetic, structural, and charge degrees of freedom [1,2]. At the same time, independent theoretical work has long predicted that members of the $RNiO_3$ family may realize multiferroicity [3]. These two features, unconventional superconductivity and magnetism-driven ferroelectricity in the perovskite parent compounds, underscore the remarkable susceptibility of nickelates to competing and coexisting electronic instabilities.

Motivated by this confluence of predicted behaviours, we investigate high-quality single crystals of $YNiO_3$, one of the nickelates at the centre of the multiferroicity hypothesis, in which magnetic order breaks inversion symmetry and induces ferroelectric polarization. Our diffraction measurements reveal strong magnetostructural coupling at the Néel temperature, manifested by a highly anisotropic structural response dominated by an abrupt b-axis contraction [4]. By utilising symmetry-adapted mode analysis, we identify the dominant ionic displacements responsible for these anomalies and outline the most plausible polar distortions emerging below the magnetic transition [5].

This study illustrates how the entangled spin-charge-lattice degrees of freedom and electronic correlations collectively shape the broader phase diagram of rare-earth nickelates.

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