

Investigating Magnetocaloric Properties of NdGaO₃

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NdGaO₃ is a rare-earth perovskite oxide that undergoes antiferromagnetic ordering below ~ 1.2 K. It is widely used as a substrate for the epitaxial growth of high-quality high-temperature superconducting thin films, including cuprates and the recently discovered nickelates. However, the intrinsic magnetic and magnetocaloric properties of the substrate can significantly influence measurements of these superconductors, particularly in high magnetic fields under adiabatic conditions, such as those employed at the pulsed Field Facility of National High Magnetic Field Laboratory (NHMFL). To evaluate the role of the substrate, we investigated the low-temperature magnetic and magnetocaloric properties of NdGaO₃ through magnetization measurements.

We observe clear antiferromagnetic ordering below 1.2 K and a large magnetic entropy change arising from field-induced suppression of magnetic disorder. These results demonstrate that NdGaO₃ exhibits a pronounced magnetocaloric effect at low temperatures. Consequently, the substrate can undergo substantial temperature changes during pulsed-field experiments, potentially affecting the measured response of superconducting nickelate thin films. These findings underscore the importance of accounting for the magnetocaloric behavior of NdGaO₃ when interpreting low-temperature, high-field measurements of superconducting heterostructures. With this research we strive to extract the magnetization, phase transition and magnetocaloric effect from NdGaO₃.

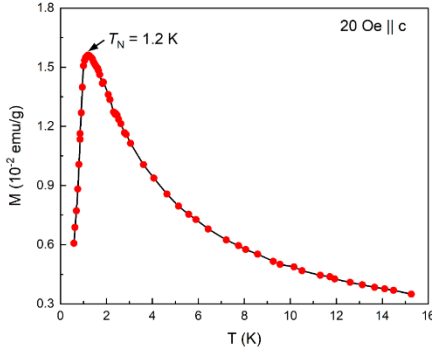


Figure 1: Magnetization M vs T

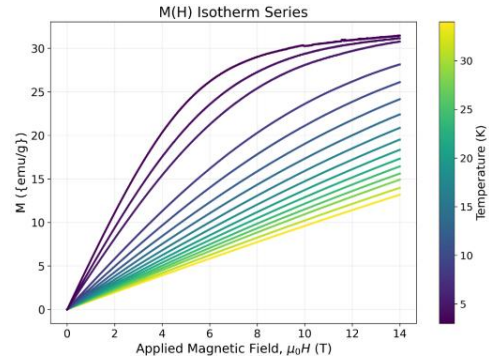


Figure 2: M(H) Isotherm Series