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Pressure Dependence of Spin Stripe Order in Nd-LSCO (x=0.125)

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$Nd_{0.4}La_{1.6-x}Sr_xCuO_4$ (Nd-LSCO) is a prototypical high T_C cuprate superconductor. At a hole-doping of x = 0.125 = 1/8, this compound is notable for displaying both static spin stripe order and charge stripe order, as well as a heavily suppressed superconducting T_C ˜ 3 K. Previous high-field transport [1] and thermopower measurements [2] have shown that the electronic properties of Nd-LSCO are highly sensitive to applied hydrostatic pressure, with a suppression of the pseudogap phase and a weakening of charge stripe order reported by P ˜ 2 GPa. In contrast, the pressure dependence of the magnetic properties of Nd-LSCO has remained largely unexplored.

In this talk, we will present neutron diffraction measurements on high quality single crystal samples of Nd-LSCO (x=0.125), performed using the VERITAS and SNAP beamlines at Oak Ridge National Laboratory. These measurements allow us to characterize the pressure dependence of the structural and magnetic phase diagrams up to P = 1.7 GPa. We observe a remarkable enhancement of spin stripe order above 1 GPa, with magnetic scattering persisting up to room temperature at maximum pressure. Applied pressure also stabilizes the tetragonal crystal structure of NdLSCO, with a significant decrease in the HTT-to-LTO transition temperature (from ˜450 K to ˜300 K at 1.7 GPa) and a corresponding increase in the LTO-to-LTT transition (from ˜68 K to ˜80 K under the same conditions).

[1] N. Doiron-Leyraud et al, Nat. Commun. 8, 2044 (2017).
[2] A. Gourgout et al, Phys. Rev. Res. 3,023066 (2021).

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Superconductivity

Keyword-2

Neutron Scattering

Keyword-3

High Pressure

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