Broadening Participation: Bridging the Research Capability Gap to Access Scientists at Smaller Institutions

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Funding Grants: G.S. Boebinger (NSF DMR-1157490, NSF DMR-1644779); J.F. DiTusa (DOE DE-SC0012432)

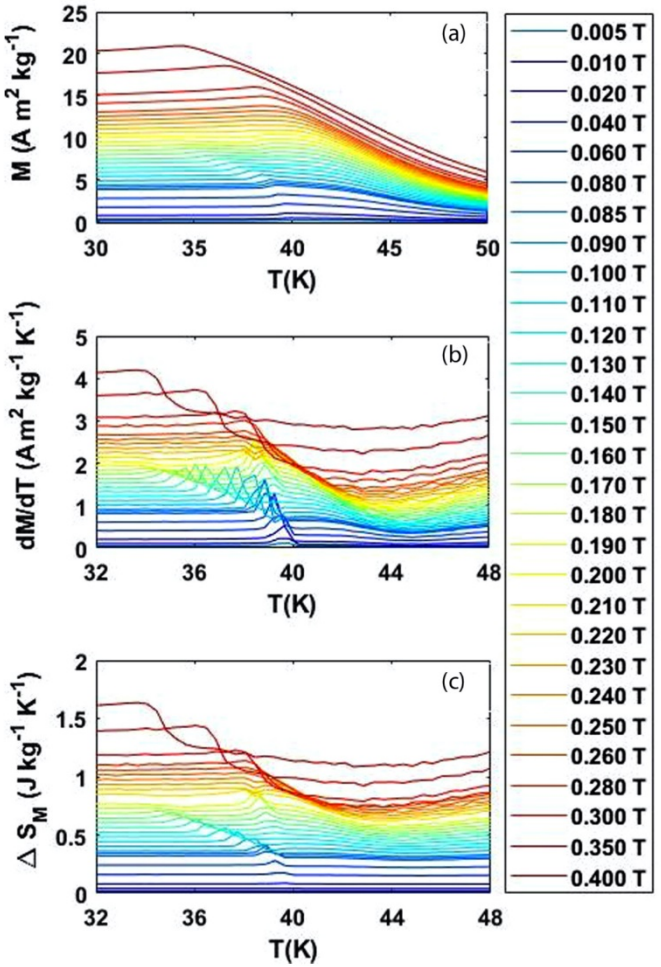
Researchers at colleges and universities that are not in the Research-1 (R1) tier typically face a larger number of obstacles for their research than their colleagues at R1 universities and national laboratories. The MagLab has discovered a pool of potential users who are unable to take advantage of the high-field magnets of the DC Field Facility due to their inability to access lower-field magnet systems that would allow them to characterize the materials they are studying and to produce the low-field data that justified the need for higher magnetic fields.

To address this capability gap, the DC Field Facility added two low-field superconducting magnet systems, SCM5 and SCM6, that allow users to characterize fundamental material properties - including resistance, magnetization, susceptibility, and heat capacity - at magnetic fields up to 7T and 9T, respectively. These systems enable users to obtain critical information needed early in the life-cycle of a protracted study of a new material that may eventually call for use of the MagLab's high-field magnets.

This work, published in Physical Review B, enabled Dhital, a faculty member at Kennesaw State University, to utilize SCM5 to explore magnetic phase transitions in the alloys $MnSi_{1-x}Al_x$ and $Fe_{1-y}Co_ySi$. One of the findings is the substantial survivability of topological skyrmion excitations in both materials, in spite of a factor of ten difference in disorder between the two materials.

Facilities and instrumentation used: DC Field Facility, SCM5.

Citation: Dhital, C.; DiTusa, J.F., *Entropic signatures of the skyrmion lattice phase in $MnSi_{1-x}Al_x$ and $Fe_{1-y}Co_ySi$,* **Physical Review B 102**, 224408 (2020) doi.org/10.1103/PhysRevB.102.224408



Magnetic entropy changes in $MnSi_{0.962}Al_{0.038}$. (a) Magnetization M as function of temperature T (b) The temperature derivative, dM/dT, of the data shown in (a). For clarity these curves are offset by 0.1 A m^2 kg^{-1} K^{-1} (c) The change in magnetic entropy ΔS_M . For clarity the curves are offset by 0.04 J kg^{-1} K^{-1} The entropy data are obtained using internal field, after demagnetization correction.