



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



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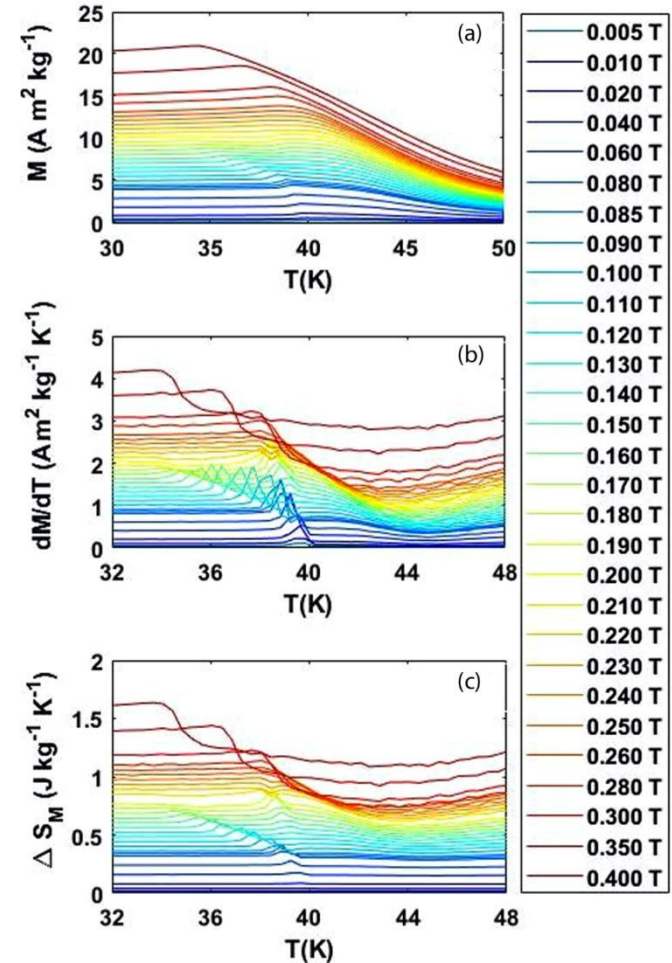
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Researchers at colleges and universities that are not in the Research-1 (R1) tier typically face a larger number of obstacles for their research than their colleagues at R1 universities and national laboratories. The MagLab has discovered a pool of 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 $\text{MnSi}_{1-x}\text{Al}_x$ and $\text{Fe}_{1-y}\text{Co}_y\text{Si}$. 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.



Magnetic entropy changes in $\text{MnSi}_{0.962}\text{Al}_{0.038}$. (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 $0.1 \text{ A m}^2 \text{ kg}^{-1} \text{ K}^{-1}$ (c) The change in magnetic entropy ΔS_M . For clarity the curves are offset by $0.04 \text{ J kg}^{-1} \text{ K}^{-1}$. The entropy data are obtained using internal field, after demagnetization correction.

Facilities and instrumentation used: DC Field Facility, SCM5.

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