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Study of topological spin texture in B20 crystalline FeGe films

EMRAH TURGUT, ALBERT PARK, KAYLA NGUYEN, ROBERT HOVDEN, School of Applied and Engineering Physics, Cornell University, Ithaca, NY 14853 USA, LENA KOURKOUTIS, DAVID MULLER, GREGORY FUCHS, School of Applied and Engineering Physics Kavli Institute at Cornell for Nanoscale Science, Cornell University, Ithaca, NY 14853 USA — The possibility of efficient and robust information storage in B20-hellimagnet systems has been attracted significant interest. Although there have been promising transmission electron microscopy (TEM) and transport studies on bulk B20 crystalline materials, the development of applications motivates study of thin-film samples grown with scalable techniques such as magnetron sputtering. Here we report transport and characterization measurements of FeGe thin films grown on Si <111>by magnetron co-sputtering. We obtain well-oriented but polycrystalline FeGe films with the B20 crystalline phase after post-growth annealing. Low temperature TEM imaging reveals that the lattice mismatch between the Si substrate and FeGe film introduces disordered helical magnetic phases. In addition, bulk susceptibility measurements of a continuous film and AMR measurements of micron-size wires indicate helical, conical, and ferromagnetic phases, but not an obvious skyrmion phase. Similar to recent reports, our measurements confirm that the observations of additional contributions to Hall effect measurements in B20 materials are not necessarily proof of magnetic skyrmion phase, and that more careful experimental studies are needed to understand thin film properties of B20 materials.

Emrah Turgut
School of Applied and Engineering Physics, Cornell University, Ithaca, NY 14853 USA

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