Facilitating Peaceful Coexistence of Skyrmions and Antiskyrmions

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Recently iron germanium (FeGe) has become a testbed for a variety of magnetic phenomena. These include the ability to host skyrmions and antiskyrmions—nanoscale whirlpools of magnetic moments that could serve as information carriers. Here users of PARADIM developed a process to tune the disorder in epitaxial FeGe films in order to facilitate the coexistence of these magnetic whirlpools of opposite types. First **FeGe thin films were grown using PARADIM's signature molecular-beam epitaxy system** to the user's specifications. After initial characterization, the samples were irradiated at Sandia National Laboratories, creating amorphized regions, forming a crystalline-amorphous composite that may host the skyrmions and antiskyrmions. Annealing at moderate temperatures recrystallizes the films and by carefully monitoring the heating-induced changes allows for finetuning the volume ratio of the crystalline-amorphous composite. Lastly, **electron microscopy characterization was performed at the PARADIM's Electron Microscopy Facility** including support by a Kavli-PARADIM Fellowship.

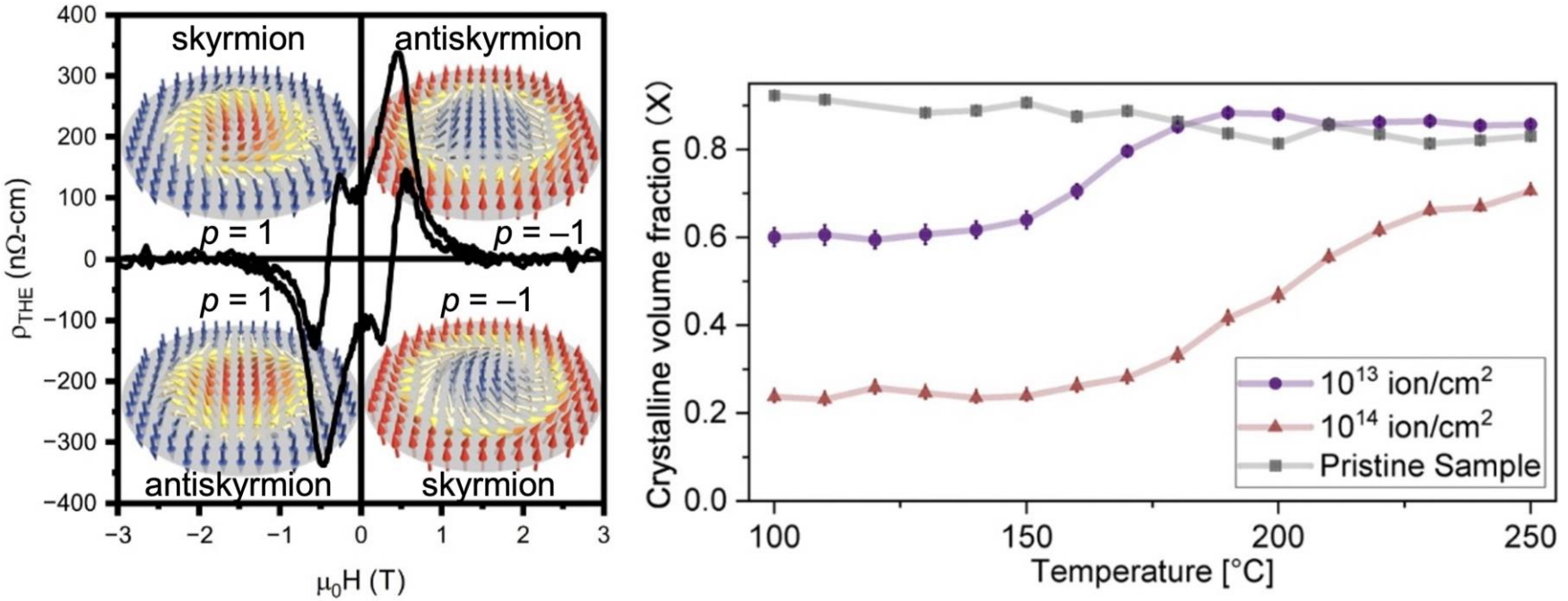

Figure: (**left**) Magnetic field-dependent topological Hall resistivity of FeGe film irradiated at 10^{13} ions/cm^2 at 100 K. Each quadrant is labeled with the corresponding topological spin texture type and polarization (p = ±1) associated with the peak or dip. (**right**) Temperature-dependent effective crystalline volume fraction X for the irradiated FeGe films during annealing.

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J. Liu, *et al.* *APL Mater.* **13**, 011112 (2025).
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