



Contribution ID: 200

Type: Talk

【816】 Emergent Dynamic Chirality in a Thermally Driven Artificial Spin Ratchet

Thursday 30 August 2018 15:30 (15 minutes)

Artificial spin ices are composed of geometrically frustrated arrangements of lithographically patterned single-domain nanomagnets. We have fabricated a spin ice based active material, a chiral ice, which converts energy into unidirectional dynamics, thus functioning like a ratchet [1] and demonstrating the potential of spin ices to build functional materials. Measurements combining photoemission electron microscopy with X-ray magnetic circular dichroism show that, following saturation, thermal relaxation proceeds through the rotation of the average magnetization in a unique sense. Micromagnetic simulations demonstrate that this emergent chiral behavior is driven by an asymmetric energy landscape. This opens the possibility of implementing a Brownian ratchet, with applications in nanomotors, actuators or memory cells. [1] Gliga, et al., Nat. Mater. 16, 1106 (2017)

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Session Classification: Magnetism and Spintronics at the Nanoscale

Track Classification: Magnetism and Spintronics at the Nanoscale