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Skyrmions in chiral magnets with Rashba and Dresselhaus Spin-Orbit Coupling[1]

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Studies of skyrmions in chiral magnets have focused largely on systems with broken bulk inversion and a Dzyaloshinkii-Moriya interaction (DMI) of the Dresselhaus form. The skyrmion crystal is then stable only in a small regime with easy-axis anisotropy. I will show how skyrmion crystal phases can be stabilized over a much larger region of field and anisotropy down to zero temperature in systems with a Rashba DMI that break surface inversion or mirror symmetry [1,2]. Increasing the ratio of Rashba to Dresselhaus DMI leads to a progressively larger domain of stability for skyrmions, especially in the easy-plane anisotropy regime. The spin texture and topological charge density then develop nontrivial spatial structures, different from conventional skyrmions, with a quantized topological charge given by a Chern number. Our theoretical results predict how tuning the Rashba spin orbit coupling and magnetic anisotropy can help stabilize skyrmion phases in thin films, surfaces, interfaces and bulk magnets with broken mirror symmetry. [1] J. Rowland, S. Banerjee, and M. Randeria, arXiv:1509.07508v2. [2] S. Banerjee, J. Rowland, O. Erten, and M. Randeria, PRX 4, 031045 (2014).

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