



Departamento de
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Emergence of a new non-relativistic magnetic class: the discovery of altermagnets

Antiferromagnetic spintronics has been one of the most active research areas of condensed matter in recent years. As we have learned how to manipulate and understand antiferromagnets actively and their emergent topology, further surprises awaited. Turning off spin-orbit coupling, a new fresh view at the family of antiferromagnetic ordered systems reveals also an emergent new class, dubbed altermagnets, with properties unique to itself and separate from ferromagnets and antiferromagnets. We report a discovery of a third distinct magnetic phase, beyond the conventional ferromagnetism and antiferromagnetism, with non-relativistic alternating spin-momentum locking, which we dub "altermagnetism". We show that this new phase is as abundant in nature as conventional ferromagnetism and antiferromagnetism, while it displays properties unparalleled in the two traditional magnetic phases, such as spin splitting by electric crystal field. Remarkably, altermagnetism was missed over the past century of quantum-magnetism research because it cannot be identified by the conventional crystallographic and relativistic magnetic symmetries, established since the early works of Bethe, Landau, Shubnikov and others. We discover the altermagnetic phase thanks to our derivation of a more general non-relativistic spin-symmetry formalism.

Jairo Sinova is an Alexander von Humboldt Professor of Physics at Johannes Gutenberg Universität Mainz since 2014, where he leads a theory group in theoretical spintronics and the Spin Phenomena Interdisciplinary Center (SPICE). After his doctorate at Indiana University (1999), he was a postdoc at the University of Tennessee and the University of Texas at Austin before becoming a professor of Physics at Texas A&M University (2003). Among his honors, he received the Alexander von Humboldt Professorship Award, the Johannes Gutenberg Research Fellowship, the ERC Advance Synergy Grant, the National Science Foundation's Career Award, the Cottrell Scholar Award, and was elected in 2011 a Fellow of the American Physical Society.

Con la colaboración de:



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