UNIVERSIDAD DEL QUINDÍO

Universidad Tecnológica de Pereira

UNIVERSIDAD DE CALDAS
LUMINA SPARGO ®

Doctorado en Ciencias

Seminario Permanente

"Yuri Alexander Poveda Quiñones"

Physics, Origin, and Design of Novel Functional Materials with Controllable Spin-Splitting

Conferencista invitado

Dr. Andrés Camilo García Castro

28 de octubre de 2021
3:00 p.m.

Ferroelectric Rashba semiconductors (FERSC), in which Rashba spin-splitting can be controlled and reversed by an electric field, have recently emerged as a very exciting new class of functional materials. However, full exploitation of the concept is still hampered by the lack of known robust ferroelectric compounds showing large Rashba spin splitting. Here, we rationalize the search of efficient FERSC within the family of perovskite oxides relying on first-principles calculations. We first highlight that the coexistence of large spontaneous polarisation and spin-orbit coupling is not sufficient to have good FERSC properties and we establish why simple ferroelectric oxide perovskites with transition metal at the B-site are typically not suitable candidates. Then, we show how this intrinsic limitation can be by-passed through interface engineering of the electronic band structure in layered perovskites and identify the ferroelectric Bi2WO6 Aurivillius phase as a promising FERSC compound. The role of distinct atomic distortions on the Rashba spin splitting is discussed. We further show that Bi2WO6 preserves its ferroelectric properties over substantial n-doping. This last feature also makes it attractive for other applications, which will be briefly discussed.

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H. Djani, A. C. Garcia-Castro, Wen-Yi Tong, E. Bousquet, Paolo Barone, Silvia Picozzi, and Ph. Ghosez, "Rashba spin-splitting in ferroelectric oxides: from rationalising to engineering", Nature NPJ Quantum Materials, 4, 51, (2019).

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