Unconventional magnetism: the emergence of altermagnetism and its new variants

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Inspired by anomalous spin transport in a peculiar compensated collinear magnet with d-wave symmetry of its spin-polarized band structure, we have developed the full delimitation and classification of collinear magnetic systems. From this, altermagnetism has emerged as a distinct and symmetry delimited new magnetic phase. Altermagnets exhibit an unconventional spin-polarized d/g/i-wave band structure in reciprocal space, originating from the local sublattice anisotropies in direct space. This gives properties unique to altermagnets (e.g., the spin-splitter effect), while also having ferromagnetic (e.g., polarized currents) and antiferromagnetic (e.g., THz spin dynamics and zero net magnetization) characteristics useful for spintronics device functionalities. I will cover the physics of their unconventional spin transport and magnetic dynamics, as well as how to possibly control them by different means.

References

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[3] O. Gomonay, et. al. arXiv:2403.10218
[4] Zhou, et. al. Phys. Rev. Lett. 132, 056701 (2024).
[5] Badura, et. al. arXiv:2403.12929

Figures

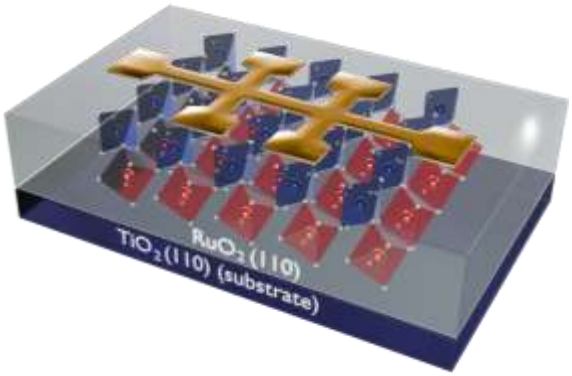

Figure 1: Hall device of altermagnetic RuO_2

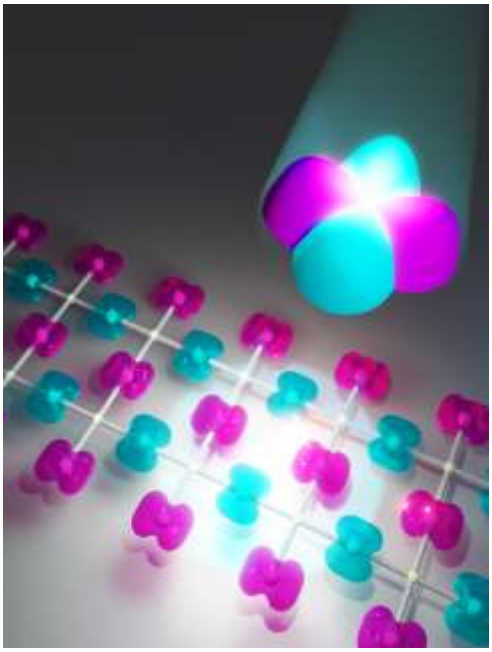

Figure 2: Crystal and momentum space representation of d-wave altermagnetism