Altermagnetism: spin symmetry prediction and experimental evidence

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Magnetic materials are traditionally classified as either ferromagnets or antiferromagnets. Here, we will show that a systematic spin symmetry classification of collinear magnets introduces a third class—altermagnetism[1]. Altermagnets feature alternating even-parity-d-, g-, or i-wave magnetization in real space and corresponding unconventional spin polarization in momentum space that breaks time-reversal symmetry without generating net magnetization [1-6]. This unconventional time-reversal symmetry breaking allows altermagnets to generate strong anomalous Hall and spin currents of unconventional symmetry, opening up exciting possibilities for spintronics applications. We will also present experimental evidence of altermagnetic time-reversal symmetry breaking in MnTe through: (i) momentum-space photoemission spectra showing altermagnetic band splitting [7-8], and (ii) real-space XMCD and XMLD mapping of altermagnetic domains [9]. Finally, we will discuss the extension of this classification to noncollinear systems, unveiling an unconventional odd-parity-wave magnetic class [10]."

References

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Figures

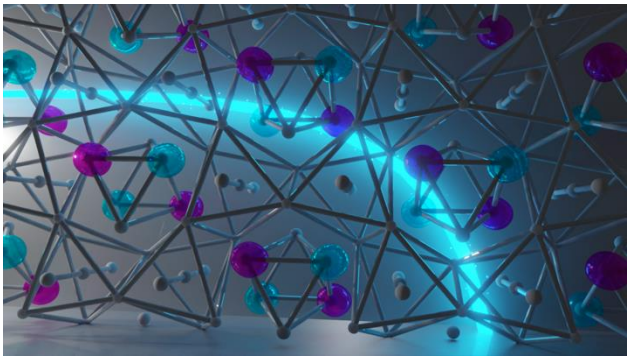

Figure 1. Visualisation of anomalous Hall current in an altermagnet.