W2S Seminar
(Webinar series on Spintronics)

Spin-orbit torque switching between reversed antiferromagnetic state and its electrical detection

Speaker:
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Abstract

Magnetic data storage is based on the switching and detection of energetically degenerate ferromagnetic ground states with reversed magnetization separated by a sufficiently high energy barrier to maintain long-term non-volatile data storage. Therefore, exploiting the many advantages of zero net moment antiferromagnets for fast and energy-efficient magnetic storage will also rely on the realization of switching and detecting stable antiferromagnetic states with reversed magnetic order. In this talk, I will discuss that switching between nonvolatile stable states and detection with opposite Néel vector orientations in collinear antiferromagnetic systems with combined spatial inversion and time-reversal (PT) symmetry can be realized by generating relativistic effective spin-orbit fields and by detecting non-linear magneto-transport responses. As a model system, we show this on a fully compensated synthetic antiferromagnet (SAF) with engineered PT symmetry and on its natural equivalent, the antiferromagnet CuMnAs. Besides just switching between "0"-s or "1"-s corresponding to two fully polarized magnetic states with reversed Néel vectors, we also show that partial switching and its detection enables the realization of nonvolatile antiferromagnetic memristor type of devices.

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