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M2Or1C-01: [Invited] Large Magneto-Electric Resistance in the Topological Dirac Semimetal Alpha-Sn

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The spin-momentum locking of surface states in topological materials can produce a resistance that scales linearly with magnetic and electric fields. Such a bilinear magneto-electric resistance (BMER) effect offers a new approach for information reading and field sensing applications, but the effects demonstrated so far are too weak or for low temperatures. This talk reports the first observation of BMER effects in topological Dirac semimetals; the BMER responses were measured at room temperature and were substantially stronger than those reported previously [1]. The experiments used topological Dirac semimetal alpha-Sn thin films grown on silicon substrates. The films showed BMER responses that are one million times larger than previously measured at room temperature and are also larger than those previously obtained at low temperatures. These results represent a major advance toward realistic BMER applications. Significantly, the data also yield the first characterization of three-dimensional Fermi-level spin texture of topological surface states in alpha-Sn.

Reference:

[1] Science Advances 8, eabo0052 (2022). DOI: 10.1126/sciadv.abo0052

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