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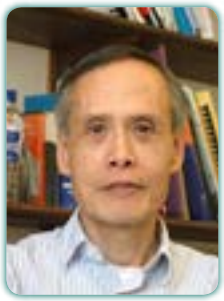

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Amorphous magnetic films for spintronics

Spintronics (SPIN TRansfer elecTRONICS) was introduced by SA Wolf in 1996 as the name of a DARPA project to develop both a non-volatile magnetoresistive random access memory (MRAM) and also magnetic sensors for specialized applications. Today, spintronics has already shown promise in ultra-low power and non-volatile information processing and data storage technology. A recent advance in spintronic material systems will be reviewed. For the rest of my talk, I will focus on amorphous rare-earth-transition-metal (*a*-RE-TM) thin films that exhibit perpendicular magnetic anisotropy (PMA). *a*-RE-TM are ferrimagnets with two ferromagnetic RE and TM sublattices that interact via antiferromagnetic exchange coupling. These amorphous ferromagnetic films exhibit large coercivity fields of several Tesla and moderate anisotropy energy ~10^6erg/cm. The magnetization of the sublattices compensates each other at the compensation temperature (T_{comp}). The spin structure and atomic-scale structure support ultrafast magnetic switching and ultra-small ~5-10 nm skyrmions. These materials are being studied for high-density ultrafast nanoelectronics. Self-exchange bias can be obtained by appropriately configuring the nanoscale structure. The mechanisms are verified by micromagnetic and atomistic simulations. Measurements include magnetization, MOKE, MFM, Hall effect, and magneto-resistance. The ability to control these new properties in amorphous films without the need for epitaxial growth could open a new avenue for enhancing the functionalities of spin-based materials.

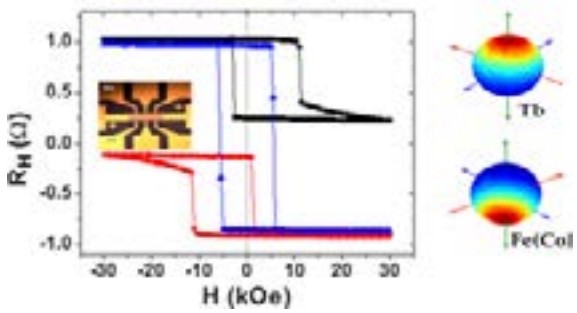

FIG: Hall resistance measurement of patterned a-TbFe amorphous film showing major and minor loops as well as exchange bias effect. Right: Monte Carlo simulated Tb and Fe spin distributions around the north and south poles.

Biography

Joseph Poon is William Barton Rogers Professor of Physics at the University of Virginia. He received his BS and PhD from Caltech and was did postdoc work at Stanford University. He has published 200+ papers. His current research is on magnetic films and thermoelectric materials. He previously worked on metallic glasses and quasicrystals.

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