Condensed Matter & Biophysics Seminar

THURSDAY

MARCH 31

4:00 P.M.

RM 184 NSH

Spin-orbitronics as a promising route towards future energy-efficient electronics

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New concepts for low-power, high-capability electronic devices are urgently required due to the rapid-reaching fundamental limits of conventional charge-based electronic devices. Spin-orbitronics, aiming at harnessing spin-orbit coupling in condensed matter for electronic computing, is a promising approach towards future energy-efficient electronics. The spin-Hall effect, existing in most d-orbital metals, is one of the most important enabling phenomena in spin-orbitronics, which have attracted increasing research interests in both fundamental and application aspects. I will first introduce the fundamentals of spin-Hall effect, followed by the various experimental approaches that allow for precise quantification of such an effect. I will then move to materials science perspective and talk about how such an effect can be influenced by introducing magnetic ordering and by studying series of antiferromagnetic materials [1-3]. Finally, I will use examples to demonstrate how such an effect could serve as a useful technology to enable many unique functions, such as driving insulating nanomagnets, for enabling future electronic devices. This work was supported by DOE-BES Materials Science and Engineering Division.

[1] W. Zhang et al, Phys. Rev. Lett. 113, 196602 (2014)
[2] W. Zhang et al, Phys. Rev. B 91, 115316 (2015)
[3] W. Zhang et al, Phys. Rev. B 92, 144405 (2015)