

“Spintronics Preeminent Team Faculty Seminar”

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MSEE, ROOM 239

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

Abstract: 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, offers 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, thus has 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 articulate how such an effect can be influenced by introducing magnetic ordering and by studying series of antiferromagnetic materials [1-4]. Finally, I will demonstrate how such an effect could serve as a useful technology in enabling applications such as driving insulating nanomagnet. Future directions on using antiferromagnets as spin current source and interfacial spin-orbit effects will be also discussed.

[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)

[4] W. Zhang et al, Materials Science and Engineering: R: Reports 105, 1 (2016)