Materials Science & Engineering Colloquium

Teaching Electrons New Tricks: Pure Spin Currents

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The new development of spintronics aims at utilizing the spin degree of freedom for electronic applications. In most investigated spintronics systems and devices, the spin and charge currents are generally in parallel and therefore directly coupled. However, using non-local geometries allows us to separate spin and charge currents, allowing the investigation of pure spin currents. Since spin-states are not necessarily conserved due to spin-flip scattering, this results in a different behavior of spin vs. charge currents. In particular, it opens the opportunity to transport spin information via exchange interactions instead of actual spin transport, thus there is a possibility of significantly reduced dissipation for devices based on pure spin currents. In this talk, Dr. Hoffman will review work at Argonne on pure spin currents as well as alternative approaches to the generation of spin currents, such as spin Hall effects and spin pumping.

Dr. Hoffman received his Ph.D. in physics in 1999 at the University of California - San Diego, under the supervision of Professor Ivan K. Schuller. Before joining Argonne in 2001, he was a postdoctoral fellow at the Los Alamos National Laboratory. His research interests encompass a wide variety of magnetism-related subjects, including basic properties of magnetic hetero-structures, spin-transport in novel geometries and biomedical applications of magnetism. Dr. Hoffman is a member of the IEEE Magnetic Society Technical Committee and the Los Alamos Neutron Science Center Materials Program Advisory Committee. He has published more than 70 articles with over 700 combined citations.

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