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Spin-pumping into organic semiconductors with tunable spin-orbit coupling[1]

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Spin-current that is generated in organic semiconductors via the process of 'spin-pumping' from ferromagnetic (FM) substrates subjected to resonant microwave absorption has attracted recently great interest, since this scheme circumvents the impedance mismatch between the organic semiconductor (OSEC) and FM injector that exists in the 'spin injection' technique. Because of the weak spin-orbit coupling (SOC) in most OSECs, the resulting inverse spin Hall effect (ISHE) in these materials is expected to be subtle, and thus limited by the microwave power applicable under continuous-wave (cw) excitation. In this talk we will describe the ISHE technique using pulsed ferromagnetic resonance, where the ISHE current is ˜2-3 orders of magnitude larger compared to that generated using cw excitation. This approach enables us to investigate the ISHE in a variety of OSECs and organic-inorganic perovskites having tunable SOC ranging from strong SOC (Pt-rich polymers and perovskites), to weak SOC polymers (such as DOO-PPV, PEDOT:PSS), to C_{60} films, where the SOC is predominantly caused by the curvature of the molecule's surface [1]. [1] Dali Sun, Kipp J. van Schooten, Hans Malissa, Marzieh Kavand, Chuang Zhang, Christoph Boehme, and Z. Valy Vardeny, Nature Materials 15, 863-869 (2016).

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