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Organometal Trihalide Perovskite Spintronics¹

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The family of organometal trihalide perovskite (OTP), $\text{CH}_3\text{NH}_3\text{PbX}_3$ (where X is halogen) has recently revolutionized the photovoltaics field, and shows promise in applications such as solar energy harnessing, light emitting diodes, field effect transistors and laser action. The OTP spin characteristic properties are influenced by the large spin-orbit-coupling of the Pb atoms, and thus may offer a new class of semiconductors for spin-based applications. In this talk we will summarize the ‘magnetic field effect’ on photocurrent and electroluminescence in OTP optoelectronic devices, and photoluminescence from OTP films [1]; and report more recent studies of pure spin-current and spin-aligned carrier injection in OTP spintronics devices using ‘spin-pumping’ and ‘spin-injection’, respectively. We measured relatively large inverse-spin-Hall effect using pulsed microwave excitation in OTP devices at resonance with a ferromagnetic (FM) layer, and giant magnetoresistance in OTP-based spin-valves. Our studies launch the field of OTP spintronics. [1] C. Zhang et al. Nat. Phys. 11, 427-434 (2015)

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