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Spin Transport and Precession in Epitaxial $BaTiO_3$/Ge Heterostructures YICHEN JIA, CRISTINA VISANI, LIOR KORNBLUM, ERIC JIN, CHARLES AHN, FRED WALKER, Yale University — Spintronics has opened up new possibilities to leverage the spin degree of freedom in electronic devices. Spin injection from ferromagnets into semiconductors has been realized by inserting a thin tunnel barrier layer, which adjusts the conductivity mismatch. However, limited functionality in conventional tunnel barriers hinders the control and manipulation of spin. Here we report the spin injection and detection in p-type Germanium (p-Ge) through a functional $BaTiO_3$ (BTO) tunnel barrier. Epitaxial BTO thin films are grown on p-Ge by molecular beam epitaxy (MBE), followed by electron beam pattern generation (EBPG) to fabricate multi-terminal spin devices. Spin accumulation is demonstrated using the Hanle technique, where the spin signal shows a non-monotonic temperature dependence. Using this temperature dependence, we investigate the dominant spin damping pathways in each temperature regime. Furthermore, we discuss the possibility of manipulating spin transport using the BTO layer, which would allow one to integrate the unique functionalities of complex oxides with semiconductor spintronics devices.

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