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Spin injection in $LaAlO_3/SrTiO_3$ heterostructures ADRIAN SWARTZ, Department of Applied Physics, Stanford University, SATOSHI HARASHIMA, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, YANWU XIE, Department of Applied Physics, Stanford University, BONGJU KIM, TAKASHI TACHIKAWA, CHRISTOPHER BELL, YASUYUKI HIKITA, Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, HAROLD HWANG, Department of Applied Physics, Stanford University — There are new device opportunities at the interface of complex oxide heterostructures due to the interplay of charge, orbital, and spin degrees of freedom. A model system is the low dimensional conducting layer generated at the interface of $LaAlO_3$ and $SrTiO_3$, which has demonstrated high mobilities and tunable carrier densities. However, little has been explored towards employing these high mobility interfaces as spin transport channels. Such conducting interfaces could be practical routes for realizing efficient spin transistors in which spin manipulation functionality could be epitaxially incorporated. First, spin injection, a key requirement of the spin transistor, must be explored. Here, we report our investigations of spin injection into the $LaAlO_3/SrTiO_3$ interface in a three-terminal geometry. Complex oxide films are grown by pulsed laser deposition and patterned into devices through lithography and hard-mask techniques. Using Hanle spin precession, we have observed spin lifetimes in the range of 80 - 100 ps. Notably, the devices exhibit unusual bias dependence in the Hanle signal and high field magnetoresistance. These results provide a building block in the field of oxide-based spintronics.

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