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Spin Transport via Nanoscale Ferromagnet/Superconductor Hybrid Tunnel Junctions DAWEI WANG, University of California, Irvine, MANJIANG ZHANG, GO TATEISHI, University of Southern California, ROBERT MUELLER, Juelich Institute, GERD BERGMANN, University of Southern California, JIA G. LU, University of California, Irvine — Ferromagnetic single-electron transistors (FMSET) combine the recent advances in magnetic tunnel junctions and single- electron transistors. Various phenomena such as enhanced magnetoresistance, magnetoresistance oscillation, spin accumulation, and superconducting gap suppression are theoretically predicted. FMSETs are fabricated using ebeam lithography and shadow evaporation techniques. The devices consist of multiple tunnel junctions in orthogonal geometry, with ferromagnetic leads (Co) of different widths perpendicular to the island (Al). They exhibit typical single electron tunneling behavior including Coulomb blockade and current oscillation vs. gate voltage. Measurements performed in applied magnetic field show bell shaped $I - H$ curves as a result of the direct influence of the magnetic field on the superconducting gap. In addition, the magnetic moment switching in the Co electrodes from parallel to antiparallel configurations give rises to a rich phenomenon of spin transport. Different transport mechanisms based on the spin accumulation effect and the Meservey-Tedrov effect are presented.

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