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Observing tunnel magnetoresistance in junctions comprising of superconductors with Zeeman-split energy bands[1] BIN LI, MIT, GUO-XING MIAO, University of Waterloo, JAGADEESH S. MOODERA, MIT — The spin-splitting of the quasiparticle density of states (DOS) in a superconductor due to Zeeman energy can lead to a highly field responsive spintronic device. We present our magnetotunneling studies in superconductor/insulator/ferromagnet tunnel junctions in which the superconducting quasiparticle DOS is energy split by an internal exchange field at the interface from an adjacent ferromagnetic insulator EuS layer. A tunnel magnetoresistance (TMR) as large as 36% is observed, and that only occurs in the superconducting state. Tunnel conductance simulation suggests that the TMR originates from the conductance variation resulting from spin selective quasiparticle tunneling. Our results show that in addition to the naturally existent spin imbalance at Fermi level in ferromagnets that gives rise to conventional TMR in standard magnetic junction (MTJs), we can manipulate tunnel conductance by tailoring spin dependent density of states with interfacial exchange fields. Furthermore, a similar TMR is also observed even with a tunnel junction with both superconducting electrodes that have exchange split DOS. [B. Li, G.-X. Miao, and J. S. Moodera, *Phys. Rev. B* **88**, 161105(R) (2013)]

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