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Room Temperature Tunnel Magnetoresistance and Spin Polarized Tunneling Studies with Organic Semiconductor Barrier T. S. SANTOS, P. MIGDAL, I. C. LEKSHMI, J. S. MOODERA, Francis Bitter Magnet Lab, MIT, Cambridge, MA, J. S. LEE, Nano-device Research Center, KIST, Seoul, Korea — Organic semiconductors, π-conjugated, with a weak spin-orbit interaction, show promise for spin-conserved transport applications.[1,2] An organic spin-valve utilizing the molecular organic semiconductor tris (8-hydroxyquinolinato)aluminum (Alq_3), demonstrated giant magnetoresistance at LHe temperatures.[1] The Alq_3 films in this spin-valve were >130nm, and the spin diffusion length was 45nm. Our current study demonstrates spin polarized tunneling through an ultra-thin layer of Alq_3 in a magnetic tunnel junction. Significant tunnel magnetoresistance was measured in a MTJ structure at room temperature, which increased when cooled to low temperatures. Tunneling characteristics, such as the I-V behavior and temperature and bias dependence of the TMR, show good quality of the organic tunnel barrier. Spin polarization of the tunnel current from Co, Fe and NiFe electrodes through the Alq_3 layer was directly measured using a superconducting Al electrode as the spin detector. This demonstration of spin-conserved transport through an organic semiconductor at room temperature shows the potential of this material for further study. Supported by KIST- MIT Program and NSF. 1) Z. H. Xiong, *et al*, *Nature* **427** 821 (2004).
2) V. Dediu, *et al*, *Solid State Commun.* **122** 181 (2002).

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