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A molecular magnet vertical tunnel junction.[1] XUANYUAN JIANG, ANDREW BROOKS, University of Florida, DUY LE, University of Central Florida, YUNDI QUAN, JOHN KOPTUR-PALENCHAR, TAEHOON KIM, KHALIL ABBOUD, RICHARD HENNIG, University of Florida, TALAT RAHMAN, University of Central Florida, XIAOGUANG ZHANG, ARTHUR HEBARD, University of Florida — We have fabricated EGaIn/CoPc/ITO heterojunctions where sublimated CoPc films as thin as 5 nm are sandwiched between transparent bottom-layer ITO and top-layer soft-landing eutectic GaIn (EGaIn) electrodes. Roughness of the CoPc films was determined by AFM to be 1.6 nm, and crystalline ordering of lying-down planar molecules was confirmed by XRD. The current-voltage characteristics of the 5 nm thick sample reveal the onset of a superconducting gap below Tc at 6 K (the transition temperature of metastable β-Ga in the EGaIn contact) thereby providing incontrovertible evidence for direct quantum mechanical tunneling processes through the magnetic molecules in our heterojunctions. Simmons' model fits of the conductance data to temperatures as high as 200 K with a weakly temperature-dependent tunnel barrier height near 1.6 eV are consistent with this interpretation. Voltage dependent features in the differential conductance measurements may relate to spin states of single molecules or aggregates of molecules and prove to be important for quantum information device development.

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