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Mechanical control of spin states in single molecules J.J. PARKS, Cornell University, A.R. CHAMPAGNE, Concordia University, T.A. COSTI, Forschungszentrum Juelich, A.N. PASUPATHY, Columbia University, W.W. SHUM, E. NEUSCAMMAN, G.K.-L. CHAN, H.D. ABRUÑA, D.C. RALPH, Cornell University — We study individual Co(tpy-SH)$_2$ complexes by connecting them within mechanically controllable break-junction devices that allow us to controllably stretch the molecule while measuring its electrical conductance. At low temperature, this molecule produces the Kondo effect, observed as a peak in the conductance at zero bias. We find that as a function of stretching the Kondo peak splits in two, in distinct contrast to behavior observed in spin-1/2 molecules. The temperature dependence of the Kondo signal for the unstretched molecule is in agreement with the scaling prediction for an underscreened $S = 1$ Kondo effect. The splitting of the Kondo resonance by mechanical stretching can be explained by a spin-orbit-induced lifting of the degeneracy of the $S = 1$ triplet upon distortion from octahedral symmetry of the Co ion. We observe evidence of the resultant spin anisotropy in the magnetic-field dependence of the Kondo peaks.

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