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The Kondo Effect in Transition Metal Ion Based Single-Molecule Transistor LAM YU, ZACHARY KEANE, Department of Physics and Astronomy, Rice University, JACOB CISZEK, LONG CHENG, MICHAEL STEWART, JAMES TOUR, Department of Chemistry, Rice University, DOUGLAS NATELSON, Department of Physics and Astronomy, Rice University — We have used an electromigration technique to fabricate single-molecule transistors (SMTs). The molecule used is $C_{32}H_{16}XN_{10}S_{4,}$where X is a single transition metal ion (e.g. Co, Ni, Cu, Zn), coordinated by conjugated ligands. Upon assembly on gold in tetrahydrofuran (THF), the molecule undergoes loss of the (CN) moieties, and the remaining molecule is covalently bonded to surface Au atoms on the electrodes of the transistors. In several devices we observed conductance features characteristic of the Kondo effect, a coherent many-body state comprising an unpaired spin on the molecule coupled by exchange to the conduction electrons of the leads. We will discuss the temperature dependence of the peak conductance and the low temperature width of the Kondo resonance of the various transition metal ion based SMTs. We have also observed asymmetric Fano-like resonances in some SMTs, which we believe result from interference between a resonant and a nonresonant conduction path through the SMTs. We will report the temperature and gate voltage dependences of the lineshape of these Fano-like resonances, and discuss possible origins of the nonresonant conduction path.

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