Supplementary Information for

Multilevel Conductance Switching for a Monolayer of Redox-Active Metal Complexes through Various Metallic Contacts

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Supplementary Figures

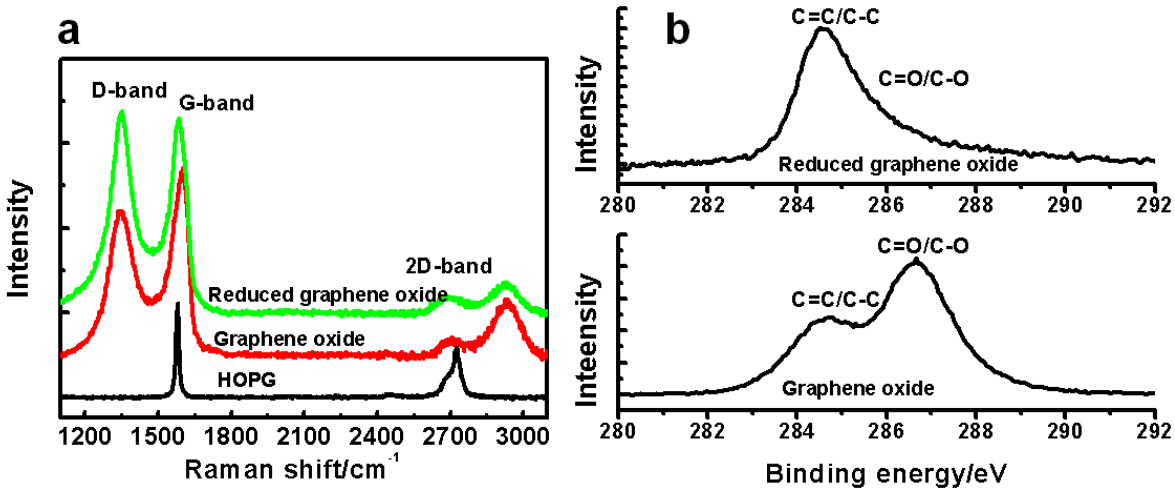

Fig. S1. (a) Raman spectra of highly oriented pyrolyitc graphite (HOPG), graphene oxide (GO), and reduced graphene oxide (rGO). (b) XPS spectra of C 1s for rGO and GO.

In Raman spectra, the first-order G- and D-band originated from vibrations of sp^2 carbon appearing at around 1600 and 1350 cm^{-1}, respectively. The intensity ratio of the D and G peaks increased as GO sheets (D/G =0.81) converted to the rGO sheets (D/G=1.02). This is due to an increase in defect density corresponding to the defunctionalized epoxide and hydroxyl groups in the basal plane. Raman spectroscopy (Reinshaw, RM1000-In Via) was obtained with excitation energy of 2.41 eV (514 nm). In XPS data, one major peak was observed in rGO for carbon-carbon peak of C=C/C–C (284.6 eV) due to sp^2 carbon bonding,

as carbon-oxygen peaks of C–O (286.1 eV), C=O (287.5 eV), and C(=O)–OH (289.2 eV) due to sp^3 carbon bonding (in graphene oxide) was drastically diminished.

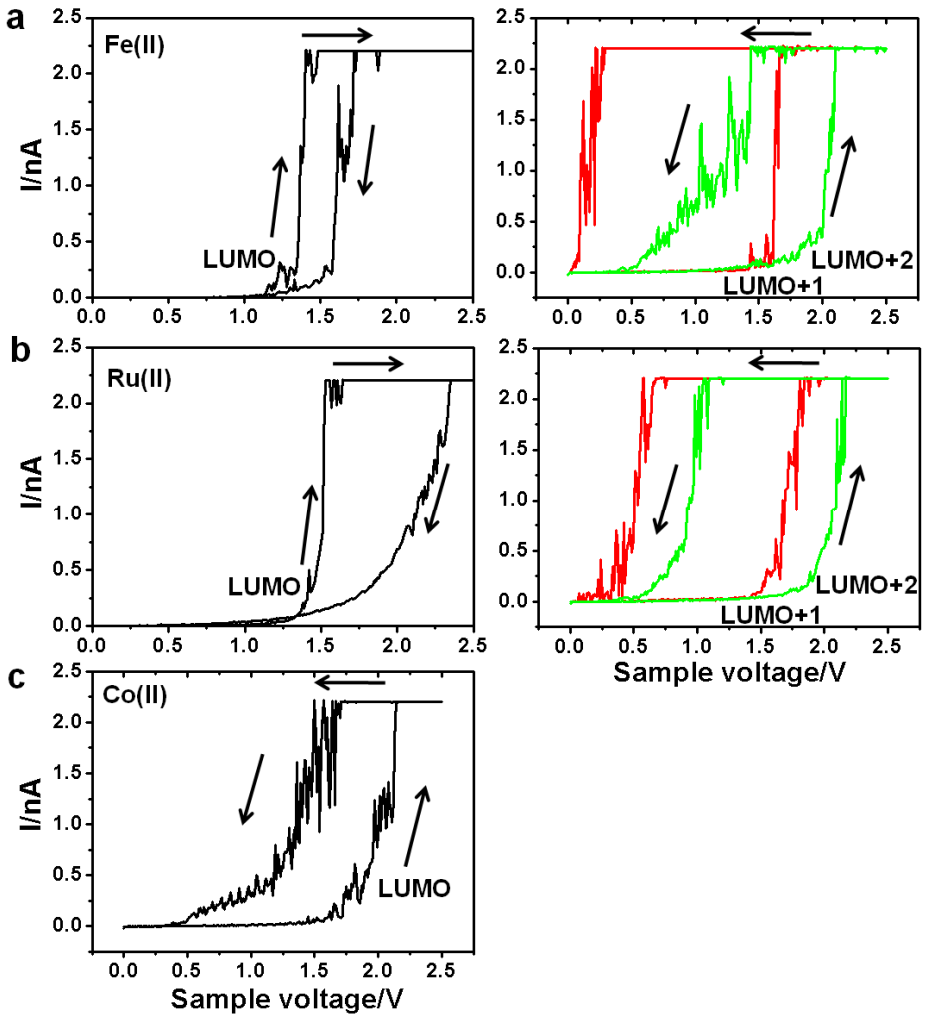

Fig. S2. (a)–(c) *I/V* curves representing conductance switching to the electron affinity levels of Fe^{II}, Ru^{II}, and $Co^{II}(tpyphs)_2$ complexes in STM-based junctions, respectively.

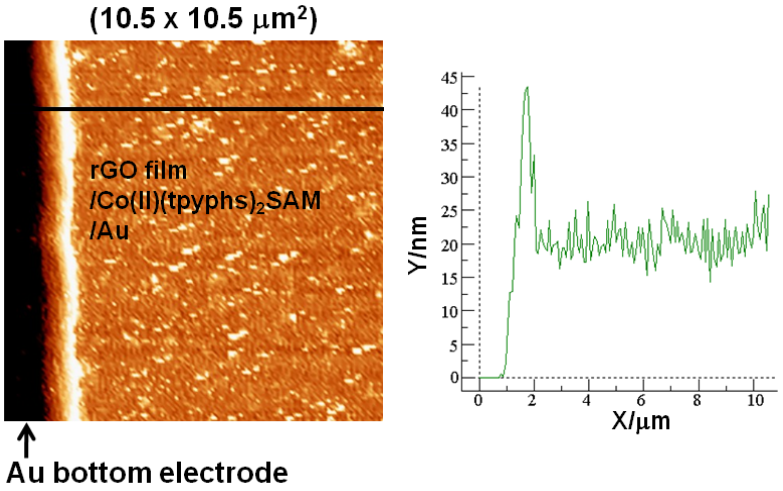

Fig. S3. Topographical AFM image of an rGO film on the $Co^{II}(tpyphs)_2$ SAM /gold. Thickness of the rGO film on SAMs was measured by about 20 nm, considering the length of molecules.

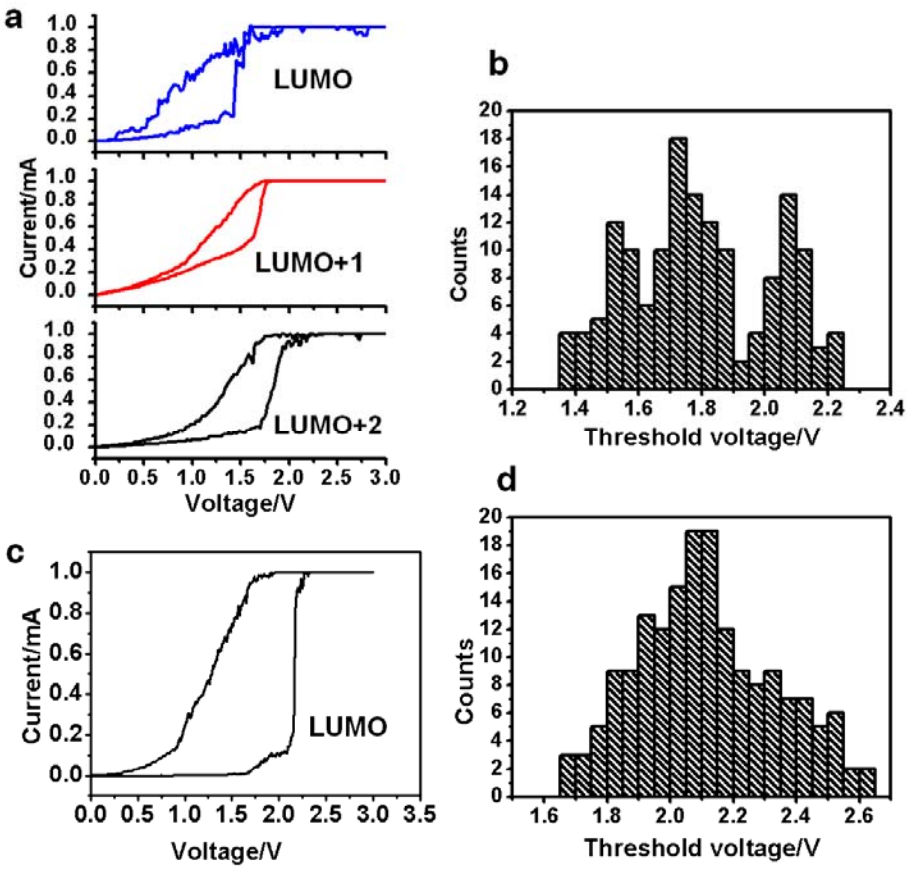

Fig. S4. (a) *I/V* curves in Au/rGO film/$Ru^{II}(tpyphs)_2$ SAM/Au devices, showing three distinguishable conductance states. (b) A statistical distribution of threshold voltage for

conductance switching in Au/rGO film/$Ru^{II}(tpyphs)_2$ SAM/Au devices. (c) *I/V* curve in an Au/rGO film/$Co^{II}(tpyphs)_2$ SAM/Au device. (d) A statistical distribution of threshold voltage for conductance switching in Au/rGO film/$Co^{II}(tpyphs)_2$ SAM/Au devices.