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Redox-driven conductance modulation of a single quantum dot in an electrolytic environment[1] GIACOMO LOVAT, University of Trieste and Columbia University, BOYEON CHOI, XAVIER ROY, LATHA VENKATARAMAN, Columbia University — Electrons confined in zero-dimensional systems exhibit shape and size-dependent electronic and optical properties of interest for many technological applications. A realization of molecular-scale quantum dots having precise shape and size is provided by the synthesis of atomically defined isostructural metal chalcogenide clusters functionalized with organic connectors, which opens the possibility of wiring up these dots without altering significantly their electronic structure. Here, we characterize the charge transport in single molecule junctions fabricated with Co_6Se_8 clusters via the scanning tunneling microscope break junction technique. The cluster structure consists of an octahedron of Co atoms concentric with a cube of Se atoms; the electrical connection to the Au leads is provided by aurophilic thiol-terminated ligands attached at the Co sites. We demonstrate that conductance modulation in a cluster junction can be achieved by controlling the charge state of the cluster. The conductance of the oxidized species differs from that of the neutral ones, consistent with the value obtained in a control experiment with chemically oxidized clusters.

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