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Ligand control of the spin states of single Mn atom on lead oxide film P. CHENG, T. ZHANG, S.H. JI, Y.S. FU, X. CHEN, X.C. MA, J.F. JIA, Q.K. XUE, Department of Physics, Tsinghua University — Controlling the spin states of individual magnetic atoms and molecules is of fundamental interests and important for atomic- scale technology. Using low temperature scanning tunneling microscopy and single molecule manipulation technique, we demonstrate that the spins of an Mn atom can be manipulated by bonding it to organic ligands (4, 4'- biphenyldicarbonitrile). This chemical reaction at single molecular level was performed on thin lead oxide film, which acts as a decoupling layer from metal substrate. The spin states of the resulting magnetic complex were probed by inelastic electron tunneling spectroscopy. Different from a single Mn atom, which shows the Zeeman splitting in the tunneling spetra, a complex formed by one Mn atom and one organic ligand exhibits zero field splitting, indicating a magnetic anisotropy of 0.58 meV. When two organic ligands are bonded to an Mn atom, the spin of the Mn atom is fully quenched.

Peng Cheng
Department of Physics, Tsinghua University

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