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Magnetic Properties of Single Cobalt Atoms on Thin MgO Films
ILEANA RAU, SUSANNE BAUMANN, CHRIS LUTZ, ANDREAS HEINRICH, IBM Research - Almaden — Studies of individual magnetic atoms on surfaces have shown magnetic anisotropies that inhibit thermal transitions over the barrier at cryogenic temperatures. To observe stable magnetic moments in single atoms at room temperatures, as would be desirable for technological applications, it is necessary to further increase the magnetic anisotropy barrier. The size of this barrier is usually limited by the quenching of the orbital moment that occurs because of the binding of the atom to its ligands. We use inelastic electron tunneling spectroscopy in a low temperature scanning tunneling microscope to measure the energy splitting between the atomic spin states of single Cobalt atoms deposited on 1 monolayer MgO on top of a metal substrate. We show that in this crystal environment the orbital moment of the magnetic atom is not quenched. This leads to the maximal spin-orbit induced separation between the spin ground and excited state and a lower bound on the magnetic anisotropy energy barrier for Cobalt of 58meV.

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