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Studies of Mn_{12}-Ph Single Molecule Magnets by LT-STM and Modeling of Magnetic Stability Under Perturbation[1] K. REAVES, Depts of Materials Science and Engineering, Physics and Astronomy, Texas A&M University; WPI-AIMR, Tohoku University, Japan, P. HAN, K. IWAYA, T. HITOSUGI, D. PACKWOOD, WPI-AIMR, Tohoku University, Japan, H.G. KATZGRABER, Depts of Physics and Astronomy, Materials Science and Engineering, Texas A&M University, H. ZHAO, K.R. DUNBAR, Dept of Chemistry, Texas A&M University, K. KIM, WPI-AIMR, Tohoku University, Japan, W. TEIZER, Depts of Physics and Astronomy, Materials Science and Engineering, Texas A&M University; WPI-AIMR, Tohoku University, Japan — We study $Mn_{12}O_{12}(C_6H_5COO)_{16}(H_2O)_4$ (Mn_{12}-Ph) single-molecule magnets on a Cu(111) surface using low temperature scanning tunneling microscopy, LT-STM. We report the observation of Mn_{12}-Ph in isolation and in thin films, deposited through vacuum spray deposition onto clean Cu(111). The local tunneling current observed within the molecular structure shows a strong bias voltage dependency, which is distinct from that of the Cu surface. Furthermore, we identify an internal inhomogeneity in the bias behavior within a single molecule. To further understand the stability of the magnetic properties of the molecules while on the surface, we develop a theoretical model to study the stability of the net magnetic moment under deformation of the spin-spin interaction graph. We develop a spin Hamiltonian-type model to predict magnetic moments that are intrinsically robust under random shape deformations to the spin-graph structure. This spin moment is shown to be a weak topological invariant for molecules with sufficiently many spin centers, approximately 20 to 50.

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