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Inelastic Electron Tunneling Spectroscopy of a Molecular Magnetic Tunnel Junction. WENYONG WANG, CURT RICHTER, National Institute of Standards and Technology — We present the results of systematic measurements of molecular magnetic tunnel junctions (MTJs). In this study, we fabricated molecular-monolayer based MTJs and show that inelastic electron tunneling spectroscopy (IETS) can be utilized to characterize such junctions to investigate the existence of desired molecular species in the device area and to study the reported bias-dependence of junction tunneling magnetoresistance (TMR). Temperature-dependent current-voltage characterizations have been performed on the fabricated molecular MTJ with octanethiol as the molecular tunnel barrier. Tunneling transport has been observed at T $<$ 50K. IETS measurement at T = 4.2 K revealed spectra signatures due to ν(Ni-S), ν(C-S), and $\delta_s(CH_2)$ vibrational modes, thus confirming the presence of the molecular species confined inside the ferromagnetic-octanethiol magnetic tunnel junctions. TMR measurements have been carried out and spin-dependent tunneling transport has been observed. A bias-dependence of the tunneling resistance has been observed. IETS measurements at different magnetic field suggest that the like cause of the TMR bias-dependence is inelastic scattering due to molecular vibrations.

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