Controlling the Properties of Magnetic Molecules to Develop the Potential Single Molecular Transistor

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Molecular-level devices are a promising candidate that can lead to the next generation of novel electronics with high sensitivity and better performance. Magnetic molecules with transition metal ion complexes demonstrate bistability between a low magnetic spin and a high magnetic spin state. Typically, these molecules can be switched between these two states through external stimuli, such as light, temperature, and pressure. For the practical application of novel electronics, isothermal switching of the magnetic spin states at ambient temperature is required. In this study, we developed an approach to use electric voltage to control the magnetic spin states. Specifically, we study how the behavior of these magnetic molecules is affected when the molecules are in the vicinity of different substrates. Various experimental techniques were utilized to analyze the quality of the molecular thin film samples. UV-Visible spectroscopy and electronic transport measurements were used to study the functionality of the magnetic molecules. We observed that the substrate layer directly affects the conductance of the magnetic molecular thin films, and they can potentially be utilized as a single molecular transistor and can lead to a quantum effect.