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Interface Effects in Spin-crossover (SCO) Thin Films on Au(111)
SUMIT BENIWAL, XIN ZHANG, University of Nebraska - Lincoln, PATRICK ROSA, JEAN-FRANCOIS LETARD, TATIANA PALAMARCIUC, Universite de Bordeaux, BERNARD DOUDIN, Universite Louis Pasteur Strasbourg, PETER DOWBEN, AXEL ENDERS, University of Nebraska - Lincoln — Thin films of the SCO molecules [Fe(H_2B(pz)$_2$)$_2$(bipy)] on Au(111) are investigated. The growth mode is determined by low temperature scanning tunneling microscopy, whereas chemical and electronic properties are determined with X-ray photoemission spectroscopy (XPS) and inverse photoemission spectroscopy (IPES). The role of substrate in determining the electronic structure is determined from thickness and temperature dependent XPS. Thin films exhibit coexistence of Fe(II) and Fe(III) oxidation states, which is different from the Fe(II) oxidation state in bulk. The fraction of molecules in the Fe(II) state increases with film thickness, which suggests that the molecules at the interface are in the Fe(III) state. Cooling the films to 100 K triggers an irreversible transition from Fe(III) to Fe(II). This transition coincides with spin phase transition, where shift of the conduction band edge away from the Fermi level is observed in IPES. These results demonstrate that thin films of this complex have different phase transition behavior as compared to bulk-like samples and underline that substrate interaction is a powerful parameter to control their structural conformation, spin state as well as electronic properties.

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