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**Reversible Control of Surface-Spin-Trans-Effect and Molecular Kondo Resonance Studied Using Scanning Tunneling Microscopy and Spectroscopy** MIN HUI CHANG, Korea University, YUN HEE CHANG, KAIST, HOWON KIM, SOON-HYEONG LEE, UN SEUNG JEON, KYUNG MIN KIM, MAHN-SOO CHOI, Korea University, YONG-HYUN KIM, KAIST, SE-JONG KAHNG, Korea University — Metal-centered organometallic complexes form 6 coordinated structures having two out-of-plane bonds that competes each other; one of the two out-of-plane bonds that formed earlier than the other is weakened with an increased bond length by the formation of the other. This well-known trans-effect in chemistry, appeared recently on metal surfaces in spin versions in regard to the coordination reactions between small molecules and metallo-porphyrin. They were studied using averaging measurements such as X-ray photoelectron spectroscopy and magnetic circular dichroism, but rarely studied at the single molecule level. Here, we demonstrate that spin interactions in Co-porphyrin/Au(111) can be controlled by coordination and de-coordination of small molecules using scanning tunneling microscopy and spectroscopy (STM and STS). With small molecule coordination, we observed that a zero-bias peak at Co-porphyrin, a signature of Kondo resonance in STS, switched off or remained but with a reduced width, i.e., Kondo temperature, and that it could be reversibly retrieved by single molecular STM manipulations. Based on our density functional theory calculation results, the reduced Kondo temperature is explained with the change in the unpaired spins in  $d_{z^2}$  orbitals of Co-porphyrin by vertical small molecule coordination.

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