Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Direct Visualization of Surface Phase of Oxygen Molecules Physisorbed on the Ag(111) Surface: A Two-dimensional Quantum Spin System SHUNJI YAMAMOTO, YASUO YOSHIDA, ISSP, The Univ. of Tokyo, HIROSHI IMADA, YOUSOO KIM, SISL, RIKEN, YUKIO HASEGAWA, ISSP, The Univ. of Tokyo — Oxygen molecule (O_2) is one of the smallest molecular magnets with an S =1 quantum spin. This makes O_2 attractive as a building block of low-dimensional (LD) quantum spin systems. Recently, the existence of a spin in physisorbed O_2 on Ag(111) was confirmed by the ortho-para conversion of molecular hydrogen. Therefore, there is a strong need for STM-based techniques with single-molecule resolution in order to verify the potential of the O_2/Ag(111) for LD quantum spin systems. Here we report the real-space observation of oxygen molecules physisorbed on an Ag(111) surface by using low-temperature scanning tunneling microscopy and spectroscopy. A well-ordered O_2 structure was observed, and the lattice was distorted from an isosceles triangular lattice. The distortion can be explained by the competition between the magnetic and elastic instabilities of the O_2 lattice. In differential tunneling conductance spectra, we found no feature of the Kondo resonance at 4.7 K; in contrast, the physisorbed O_2 on Ag(110) showed a clear Kondo resonance at 18 K. Based on these observations, we discuss the realization of an S =1 two-dimensional antiferromagnetic quantum spin system.

Shunji Yamamoto
ISSP, The Univ. of Tokyo

Date submitted: 06 Nov 2015 Electronic form version 1.4