Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Probe LDOS of a single defect on TiO2(110) surface under the illumination of ultrashort laser pulses LIHUAN SUN, JIANMEI LI, ANNING DONG, DONG HAO, YANG GUO, XINYAN SHAN, XINGHUA LU[1], Institute of Physics, Chinese Academy of Sciences, SF05, STATE KEY LABORATORY FOR SURFACE PHYSICS TEAM — TiO2 has many applications such as solar energy harvest, photo-catalysis, environment protection, and so on. The functionality of such material is usually determined by the characteristic electronic states within the bandgap as resulted from the dopants or impurities. Here we present a study in modulating the electron of a single OH-O2 defect on TiO2 (110) surface by ultrashort laser pulses. The topographic structure and the electron of the defect are obtained by scanning tunneling microscopy and spectroscopy at a cryogenic temperature of about 20 K. Giant changes in electron are observed under the illumination of ultrashort laser pluses. By increasing the laser power up to about 0.23GW/cm^2, the observed center energy of the gap state is shifted by 0.2 eV, away from the Fermi level. Meanwhile, the electron intensity of the gap state is increased by a factor of 2. Possible origins of such effect have been considered including optical Stark effect, thermal effect, and photo-induced conductivity. Our observation provides new insights into interactions between photons and localized electronic states in semiconductors at the single defect site scale.

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Date submitted: 11 Nov 2016 Electronic form version 1.4