Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Dynamics of Interfacial Charge Transfer in Semiconductor Crystalline Film-Assisted Photocatalyst WEI SEA CHANG, CHIEN NGUYEN VAN, YING-HAO CHU, National Chiao Tung University, C-W LUO TEAM, C-L WU TEAM, Y-J HSU TEAM — Semiconductors are by far the most intensively studied photocatalytic materials due to their favorable electronic and optical properties. Many have reported on semiconductor particles for their size quantization effect. The discrepancies about particle sizing, however, have always been questioned as to what is the optimum particle size for quantization effects to be observed. Here, we offer a novel semiconductor/metal architecture to understand the mechanism of interfacial charge transfer in a visible-light driven redox reaction. Semiconductor $BiFeO_3$ (BFO) film with preferred orientation were synthesized by using pulsed laser deposition. Au nanoparticles were produced by post-thermal annealing under oxygen atmosphere to distribute over the semiconductor film surface. High resolution X-ray diffraction and transmission electron microscopy results indicate that the Au (111) nanoparticles are partially embedded on the (100)-, (110)-, and (111)-oriented BFO film. A comprehensive study of the electronic properties has been performed by ultrafast pump-probe and X-ray photoelectron spectroscopy. We seek to answer how oriented-semiconductor films with Au nanoparticles distributed uniformly over the film would affect the dynamics of photocatalytic reactions.

Ying-Hao Chu
National Chiao Tung University

Date submitted: 14 Nov 2013 Electronic form version 1.4