Electronic Supplementary Material (ESI) for Energy & Environmental Science

Supporting Information

Cobalt-bilayer Catalysts Decorated Ta_3N_5 Nanorod Array as Integrated Electrodes for Photoelectrochemical Water Oxidation

Jungang Hou, Chao Yang, Zheng Wang, Huijie Cheng, Shuqiang Jiao,* Hongmin Zhu*

State Key Laboratory of Advanced Metallurgy, School of Metallurgical and Ecological Engineering,

University of Science and Technology Beijing, Beijing 100083, China

Corresponding author: sjiao@ustb.edu.cn; hzhu@ustb.edu.cn

Tel: (+86) 10 62334204; Fax: (+86) 10 62334204

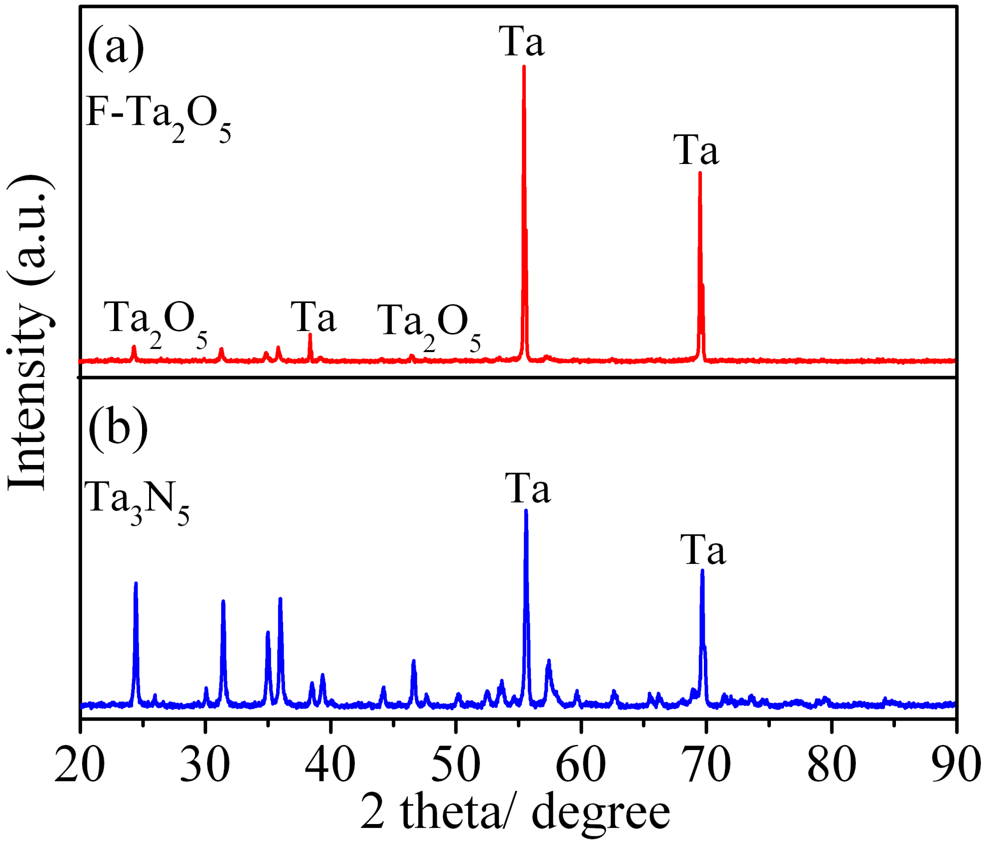

Figure S1. XRD patterns of (a) F-Ta_2O_5 nanorod arrays and (b) Ta_3N_5 nanorod arrays on the Ta substrates.

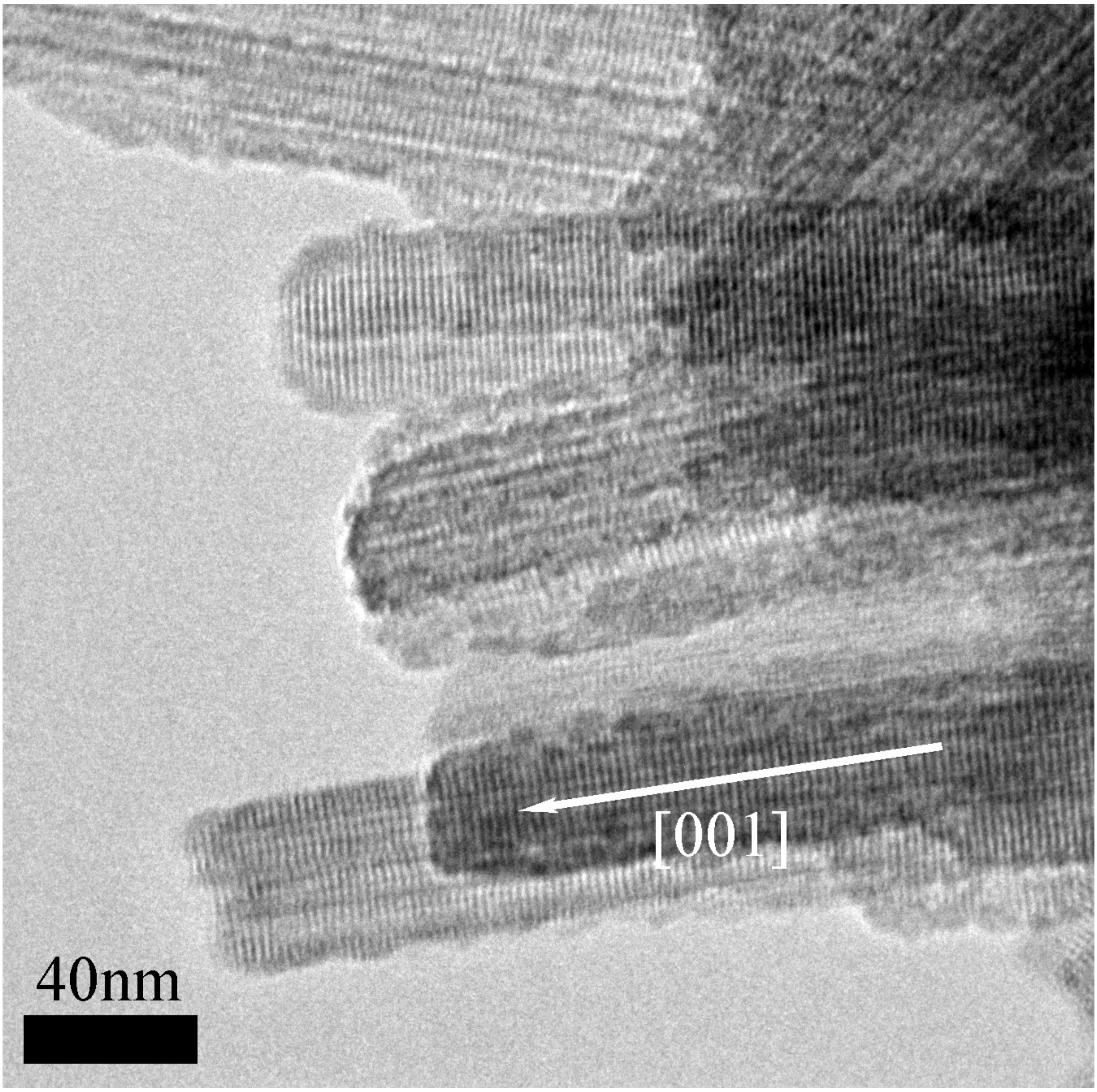

Figure S2. High resolution TEM image recorded from a single F-Ta_2O_5 nanorod with preferential growth along the [001] direction.

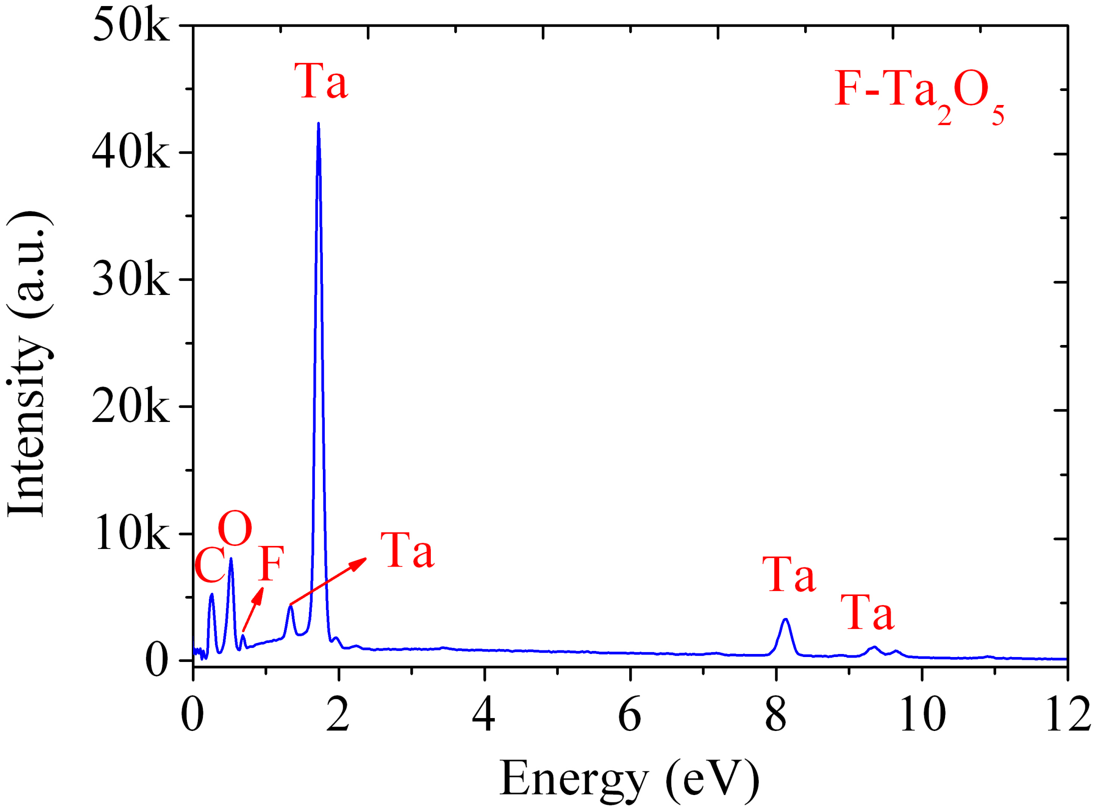

Figure S3. Energy-dispersive X-ray spectroscopy of the elments Ta, O and F in the F-Ta_2O_5 nanorod samples.

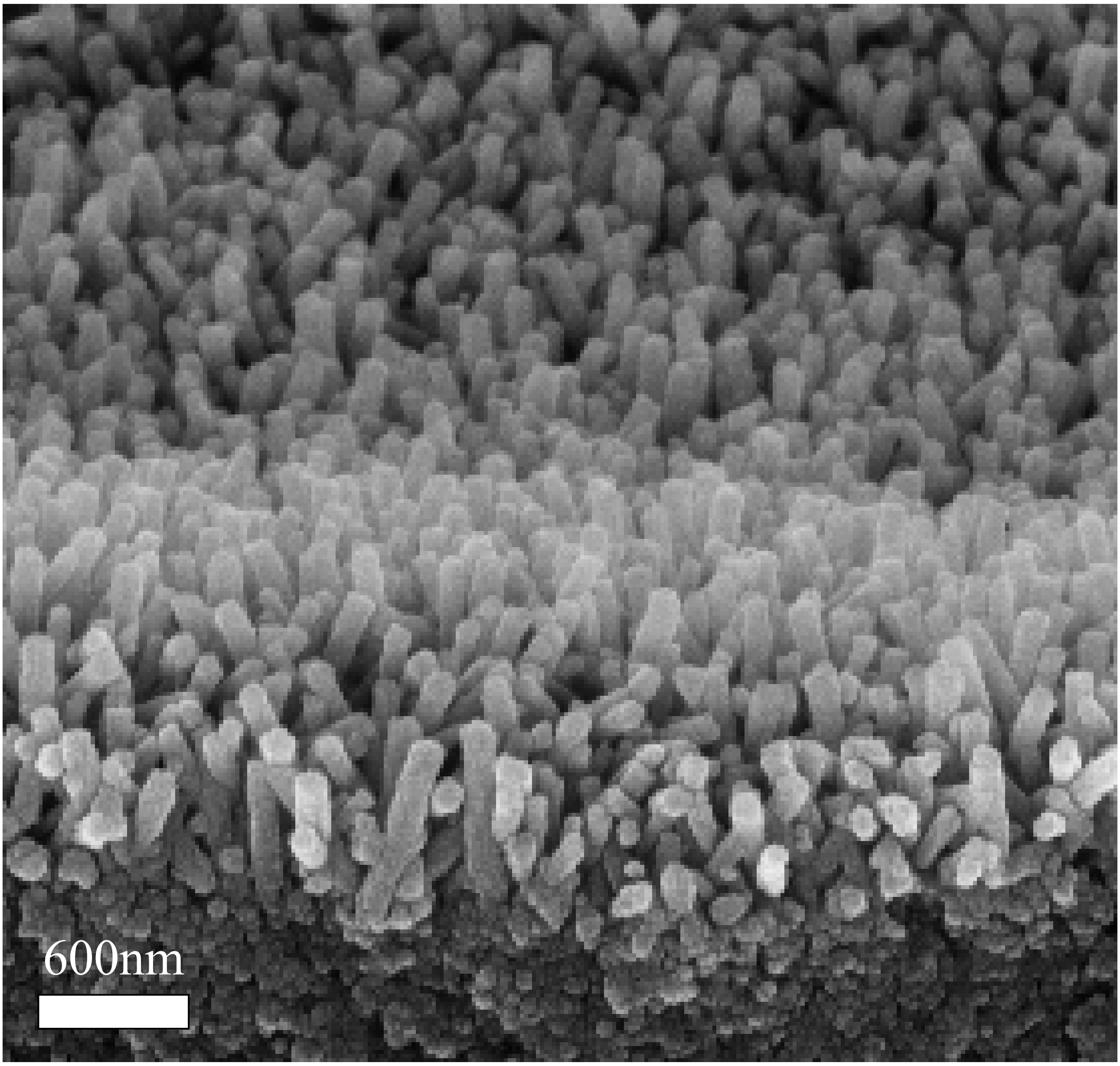

Figure S4. Typical cross-sectional SEM image of the Ta_3N_5 nanorod array.

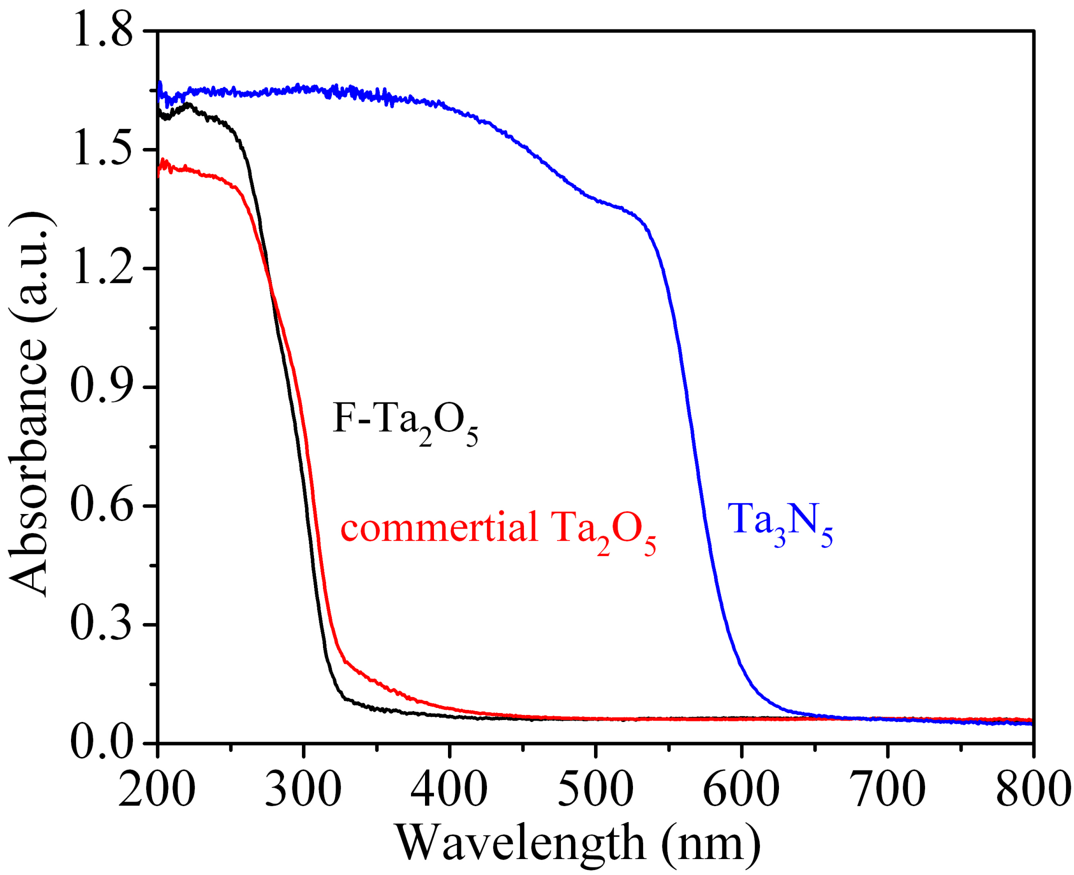

Figure S5. UV-visible absorption spectrum of commertial Ta_2O_5, F-Ta_2O_5 nanorods, and Ta_3N_5 nanorods samples.

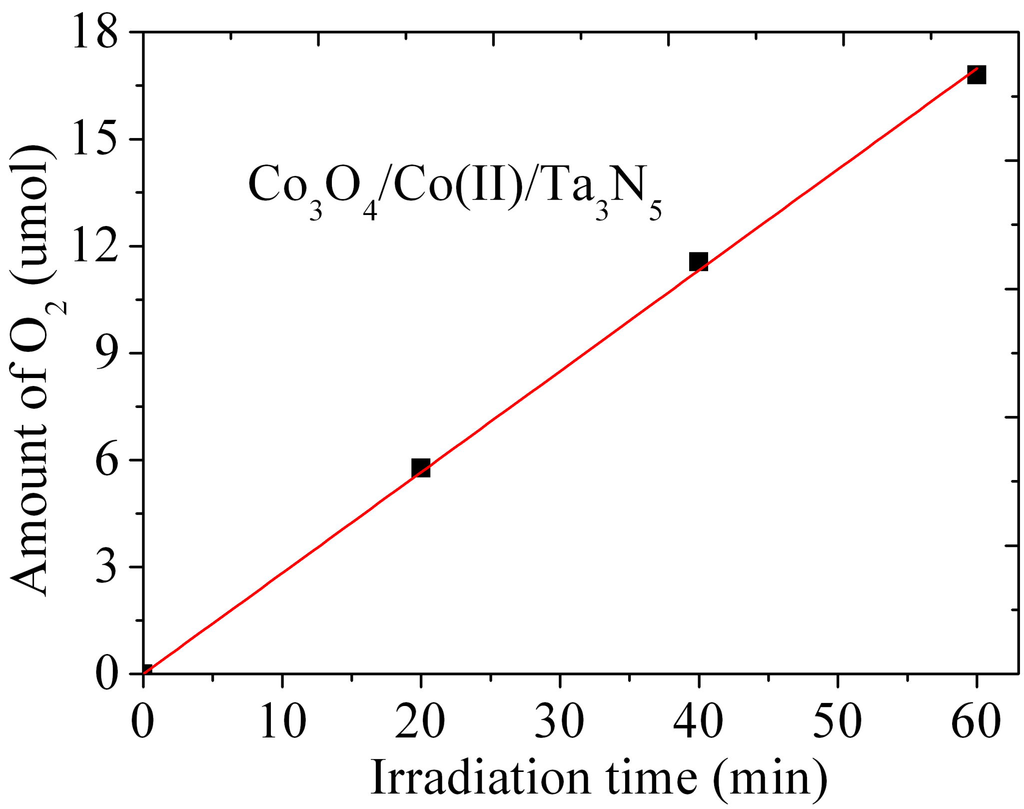

Figure S6. The O_2 production of Co_3O_4/Co(II)/Ta_3N_5 nanorods measured in 1.0 M NaOH solution (pH=13.6) in the three electrode system at an applied potential of 1.23 V vs. RHE AM 1.5G simulated sunlight at 100 mW/cm^2. The oxygen evolution by photoelectrochemical water splitting was conducted in the airtight reactor connected to a closed gas circulation system. The 300W Xe lamp (MAX-302, Asahi Spectra) under AM 1.5G illumination with a density of 100 mW cm^{-2} (Newport) was used to irradiate only visible light. The amount of oxygen was determined by a gas chromatography (GC-3240) equipped with TCD (molecular sieve 5 Å column, Ar carrier gas).

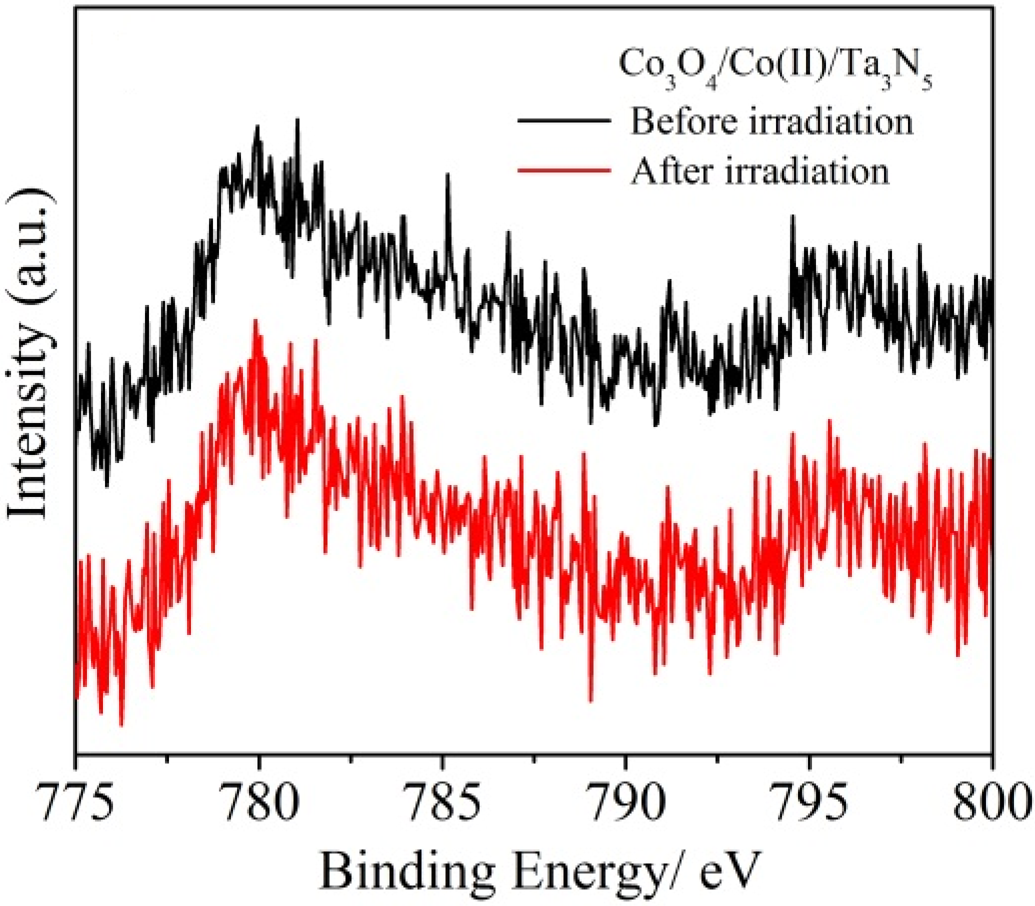

Figure S7. XPS spectra of Co 2p for Co_3O_4/Co(II)/Ta_3N_5 nanorods.