

Supporting Information

Highly-active tantalum (V) nitride nanoparticles prepared from a mesoporous carbon nitride template for photocatalytic hydrogen evolution under visible light irradiation

Leny Yulianti, Jae-Hun Yang, Xinchun Wang, Kazuhiko Maeda, Tsuyoshi Takata, Markus Antonietti, Kazunari Domen

Dr. L. Yulianti*, Dr. J. Yang, Dr. K. Maeda, Dr. T. Takata, Prof. K. Domen

Department of Chemical System Engineering

School of Engineering, The University of Tokyo

Bunkyo-ku, Tokyo 113-8656, Japan

Fax: (+) 81-3-5841-8838

E-mail: domen@chemsys.t.u-tokyo.ac.jp

*Present address:

Ibnu Sina Institute for Fundamental Science Studies, Universiti Teknologi Malaysia,
UTM Skudai, Johor 81310, Malaysia

Prof. X. Wang

State Key Laboratory Breeding Base of Photocatalysis

Fuzhou University, Fuzhou 350002, China

Prof. M. Antonietti

Max-Planck Institute of Colloids and Interfaces

Department of Colloid Chemistry

Research Campus Golm, 14424 Postdam, Germany

Detailed photocatalytic experiments

Photocatalytic hydrogen evolution was carried out in a closed gas circulation system.

The photocatalyst (0.2 g) was spread in an inner-irradiated Pyrex glass containing 400 ml of methanol solution (20 vol%). Methanol acts as an electron donor, so that water can be reduced into hydrogen. After several repeated evacuations, the reaction was carried out under visible irradiation (of wavelength longer than 400 nm) by a high-pressure Hg lamp 450 W for 5 h. The reaction temperature was maintained near room temperature by flowing cool water during the irradiation. The hydrogen product was detected by gas chromatography with a thermal conductivity detector.

Figure S1. The nitrogen adsorption-desorption isotherm and BJH pore distribution of mesoporous C_3N_4 having pore size of 7, 12, and 24 nm.

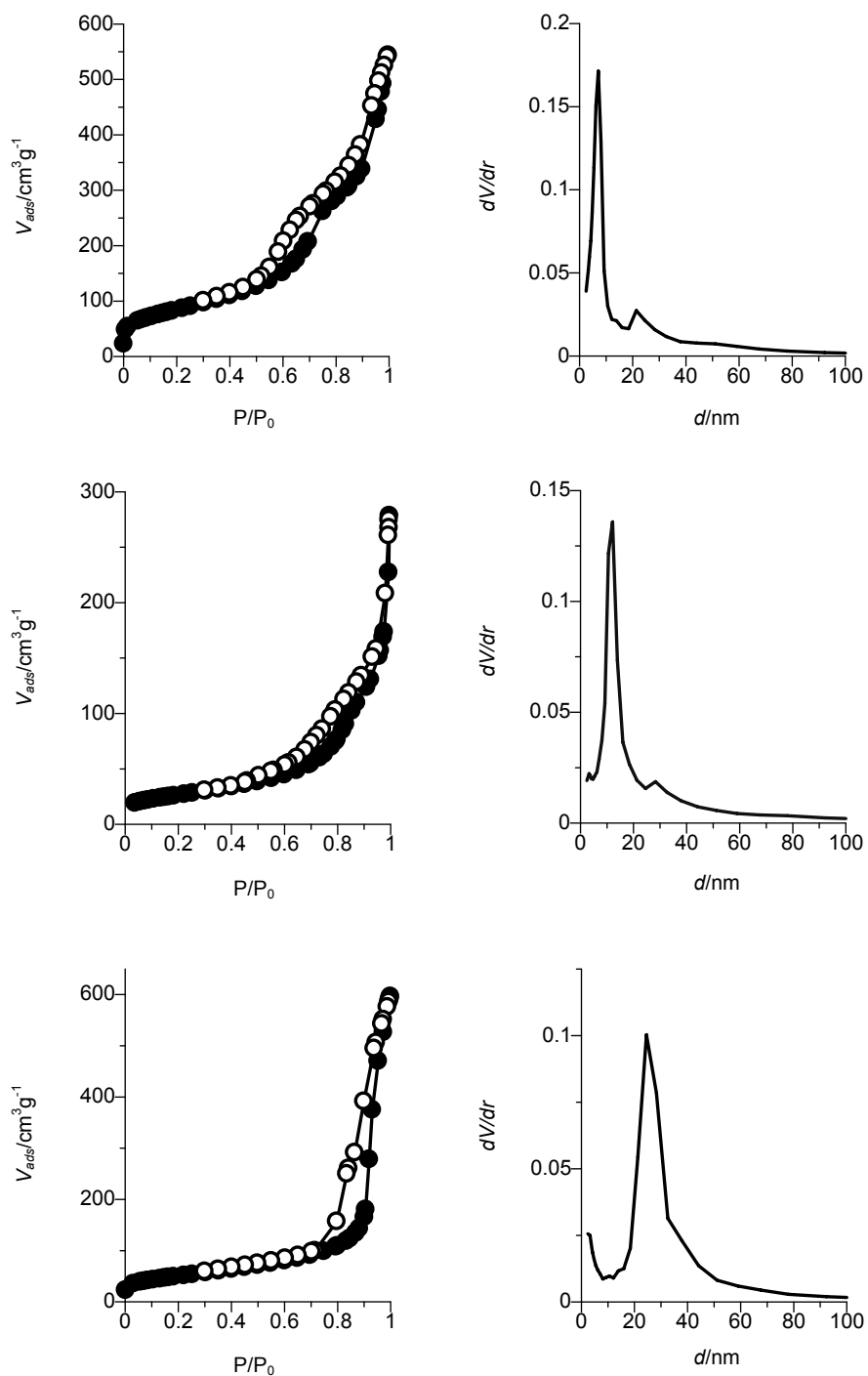


Figure S2. XRD patterns of the newly prepared and reference samples.

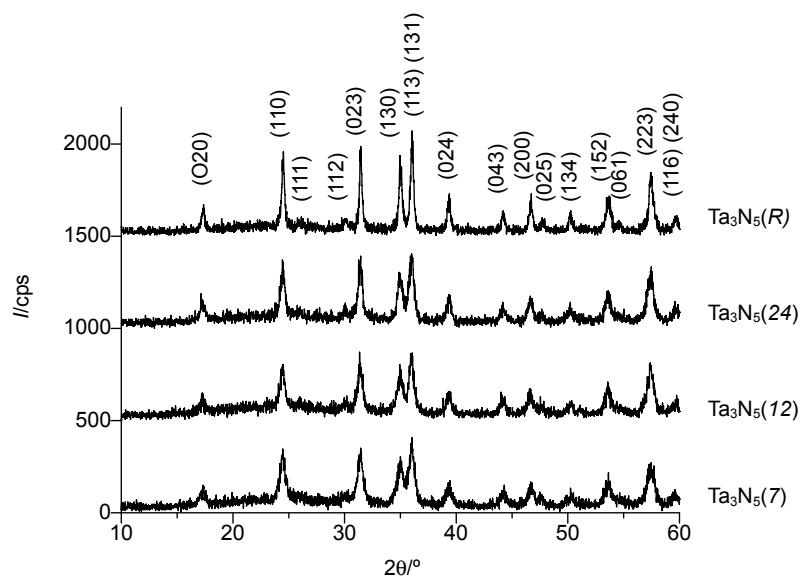


Figure S3 The appearance color of Ta_3N_5 nanoparticles and the bulk one. The Ta_3N_5 nanoparticles, which is represented by $\text{Ta}_3\text{N}_5(7)$, has a bright red-orange color, while the bulk Ta_3N_5 , which is represented by $\text{Ta}_3\text{N}_5(R)$, has a red-black color.

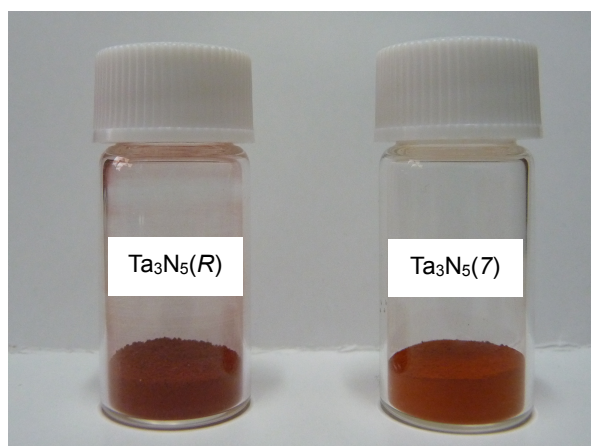


Figure S4 Effect of platinum loading amount on the activity of various Ta₃N₅ samples for photocatalytic hydrogen evolution.

