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

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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$_3$N$_4$ 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 Ta₃N₅ nanoparticles and the bulk one. The Ta₃N₅ nanoparticles, which is represented by Ta₃N₅(7), has a bright red-orange color, while the bulk Ta₃N₅, which is represented by Ta₃N₅(R), has a red-black color.
Figure S4 Effect of platinum loading amount on the activity of various Ta$_3$N$_5$ samples for photocatalytic hydrogen evolution.