Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supplementary Information

Photocatalytic hydrogen generation from methanol-water mixture in presence of g-C_3N_4 and graphene/g-C_3N_4

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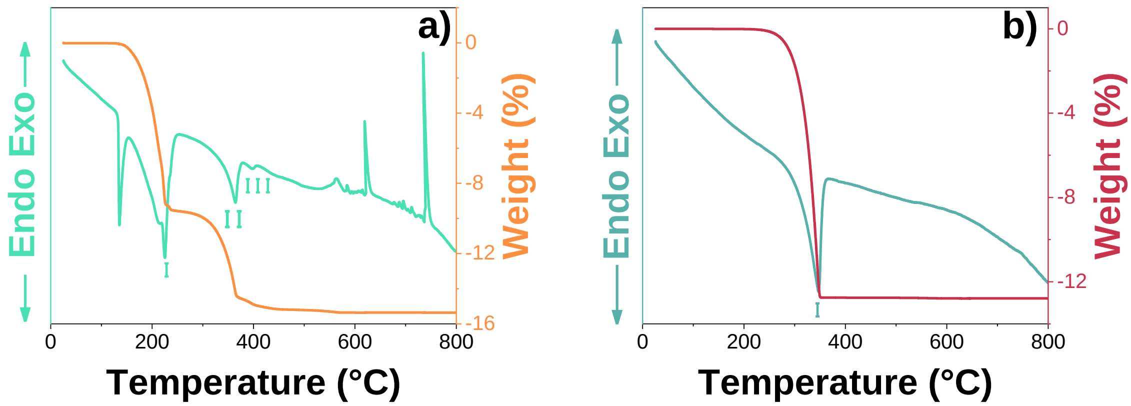

Figure S1. TG/DTA curves of urea and melamine pyrolysis in air (a, b respectively).

Table S1: Comparison of typical g-C_3N_4 photocatalysts reported for hydrogen generation.

Material	H_2 generation rate (μmol.g^{-1})	AQY (%)	Reference
g-C_3N_4 (dicyandiamide)	1105	3.457	[S1]
g-C_3N_4 (cyanamide)	106.9	0.1	[S2]
g-C_3N_4 (MCA_DMSO)	261.3	3.1	[S3]
g-C_3N_4 (Zinc-doped)	59.5 μmol.h^{-1}	3.2	[S4]
Exfoliated g-C_3N_4 (melamine)	343.81	Not specified	[S5]
g-C_3N_4 (melamine)	**1350**	**4.19**	**This study**

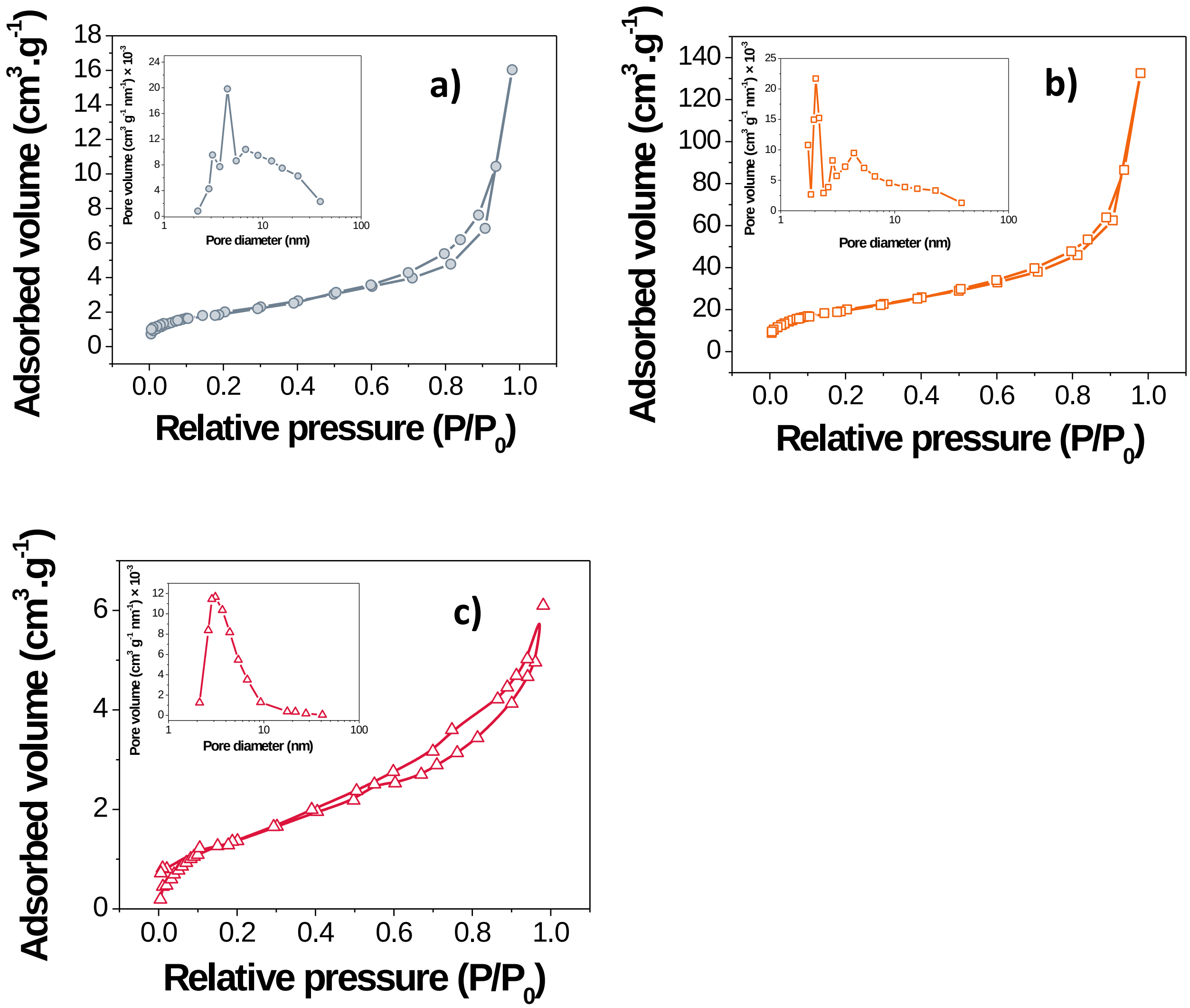

Figure S2 – Type-IV sorption isotherms of samples: a) **BM**; b) **BU**, c) **EM**. In the inset is shown the pore-size distribution.

TableS2: specific surface area (SSA) of the unmodified specimens.

Sample	SSA_{BET} ($m^2.g^{-1}$)
BM	7.4±0.1
BU	72.8±0.3
EM	25.4±0.9

Apparent quantum yields calculations:

The apparent quantum yield (AQY) of products can be described as hydrogen (2 electrons), as presented in Eq. (1):

$$AQY = \frac{Product\ yields\ (\mu mol/s) \times no\ of\ electrons}{Photon\ flux\ (\mu mol/s)} \times 100 \quad (1)$$

where, yields of products and photon intensity both are in µmol. Photon intensity can be calculated according to the Eq. (2).

$$Photon\ flux\ (\mu mol/s) = \frac{Intensity\ of\ light \times Wavelength}{Planck\ constant \times Photon\ density} \times \frac{Incident\ area}{Avogadro's\ constant} \quad (2)$$

The intensity of lamp is represented in $W.m^{-2}$, light wavelength is in meters (m) and reactor incident area is calculated in m^2. Planck's constant, photon density, and Avogadro's number are constants of Eq. 2 with values 6.63×10^{-34} J.s, 3×10^{8} $m.s^{-1}$ and 6.023×10^{23} mol^{-1}, respectively.

<u>Parameters</u>

Light source	8 W Hg lamp	
Wavelength	254 nm	254×10^{-9} m
Intensity of lamp	1.213 $mW.cm^{-2}$	12.13 Wm^{-2}($J.s^{-1}.m^{-2}$)
Incident area	190 cm^2	19×10^{-3} m^{-2}
Product rate (after 4 h) for BM	1352 $\mu mol/g_{cat}$	9.39×10^{-3} $\mu mol.s^{-1}$
Apparent quantum yield for BM	4.19 %	
Product rate (after 4 h) for BU	1321 $\mu mol/g_{cat}$	9.17×10^{-3} $\mu mol.s^{-1}$
Apparent quantum yield for BU	4.09 %	
Product rate (after 4 h) for EM	1263 $\mu mol/g_{cat}$	8.77×10^{-3} $\mu mol.s^{-1}$
Apparent quantum yield for EM	3.91 %	
Product rate (after 4 h) for P25	1052 $\mu mol/g_{cat}$	7.31×10^{-3} $\mu mol.s^{-1}$
Apparent quantum yield for P25	3.26 %	

Example of calculation:

$$Photon\ flux\ (\mu mol) = \frac{Intensity\ of\ light \times Wavelength}{Planck\ constant \times Photon\ density} \times \frac{Incident\ area}{Avogadro's\ constant}$$

$$Photon\ flux\ (\mu mol) = \frac{12.13 \times 254 \times 10^{-9}}{6.63 \times 10^{-34} \times 3 \times 10^{8}} \times \frac{19 \times 10^{-3}}{6.023 \times 10^{23}} = 4.4886 \times 10^{-7}\ mole/s =$$

$$0.4486\ \mu mole/s$$

$$AQY = \frac{Product\ yields\ (\mu mol) \times no\ of\ electrons}{Photon\ flux\ (\mu mol)} \times 100$$

$$AQY = \frac{9.39 \times 10^{-3} \times 2}{0.4486} \times 100 = 4.19\ \%$$

Supplementary Information References:

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