Electronic Supplementary Information

Enhancement in the Photocatalytic Activity of Carbon Nitride through Hybridization with Light-sensitive AgCl for Carbon Dioxide Reduction to Methane

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(1) CO_2 photocatalytic reduction supplementary data

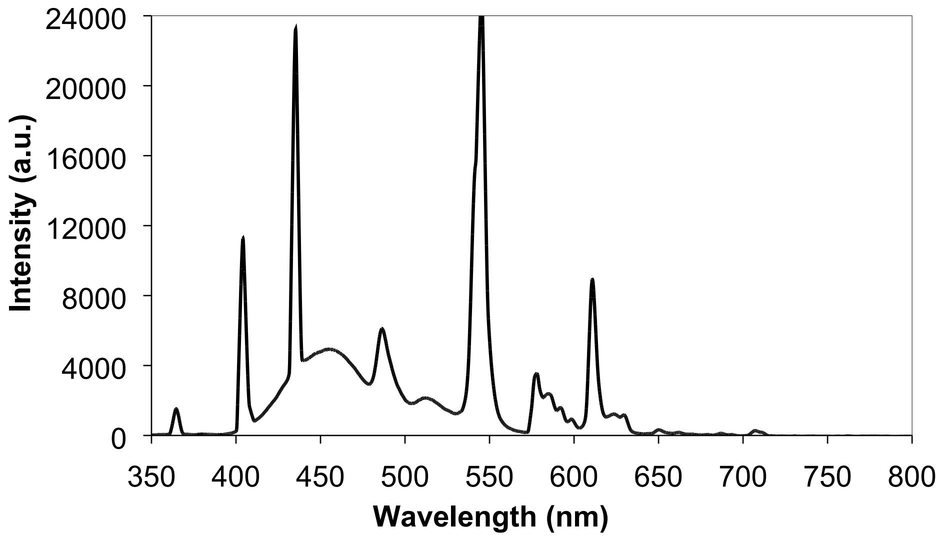

Figure S1. 15W daylight lamp spectrum

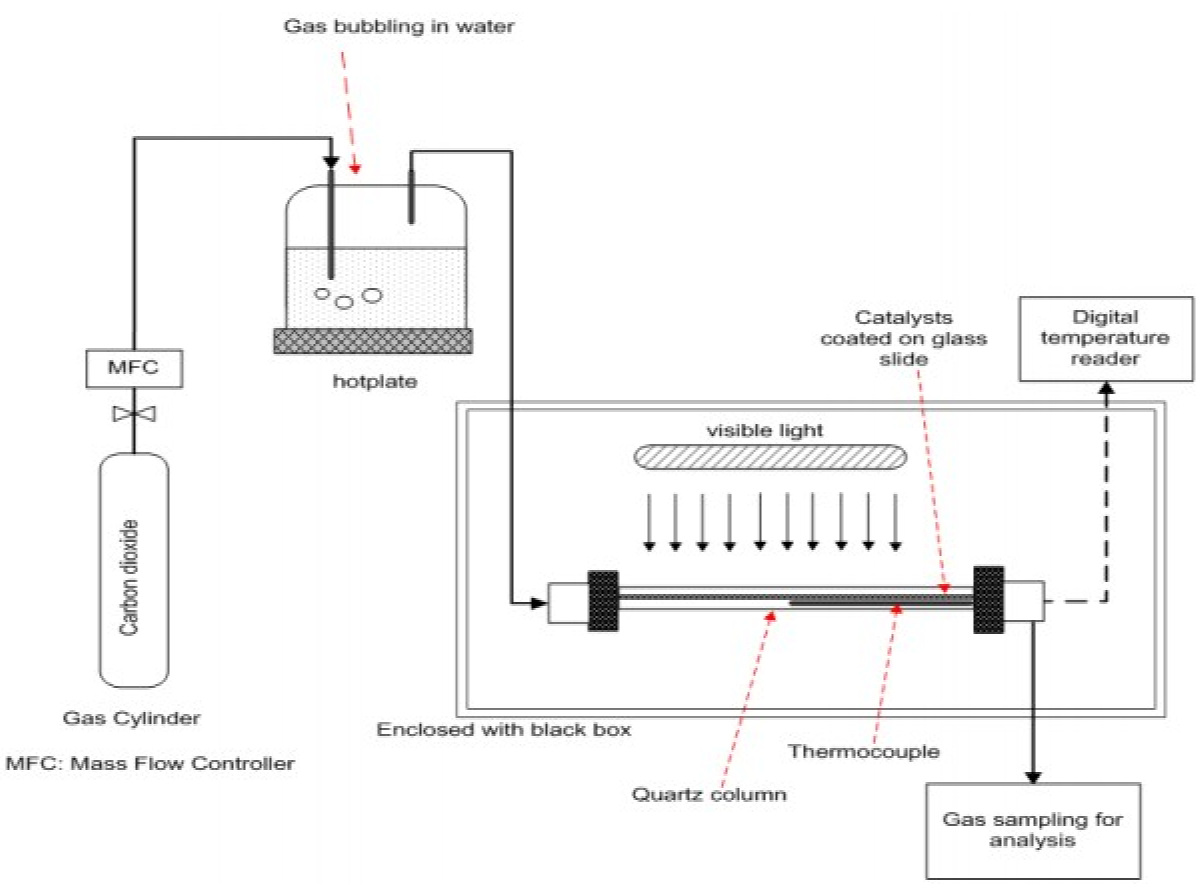

Figure S2. A schematic representation of the gas phase photocatalytic reactor setup

(2) TEM image of urea-derived Carbon Nitride

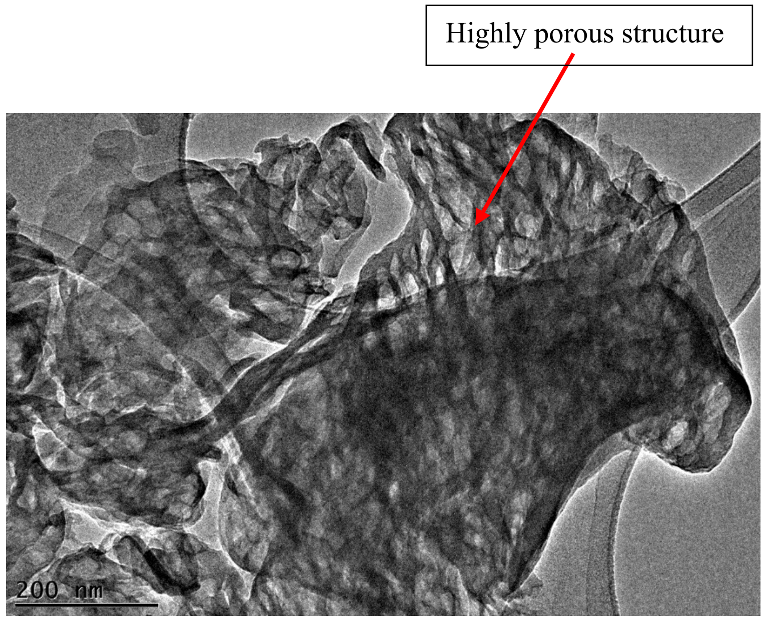

Figure S3. TEM image of as-prepared carbon nitride

(3) Protonated CN (p-CN) FTIR analysis

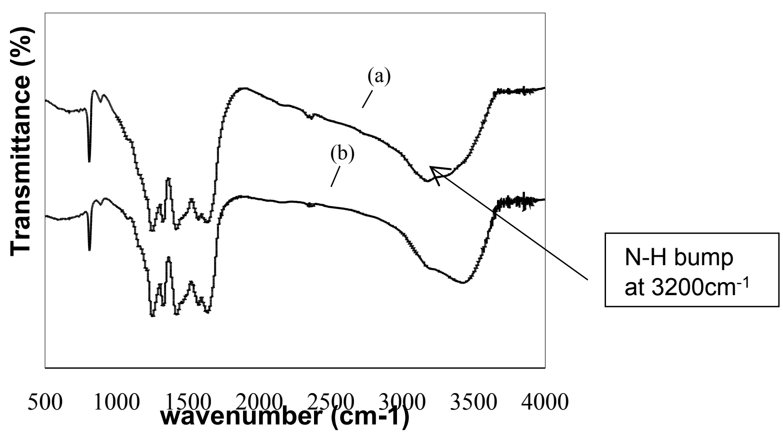

Figure S4. FTIR spectra of (a) protonated CN and (b) CN

(4) Particle distribution histogram

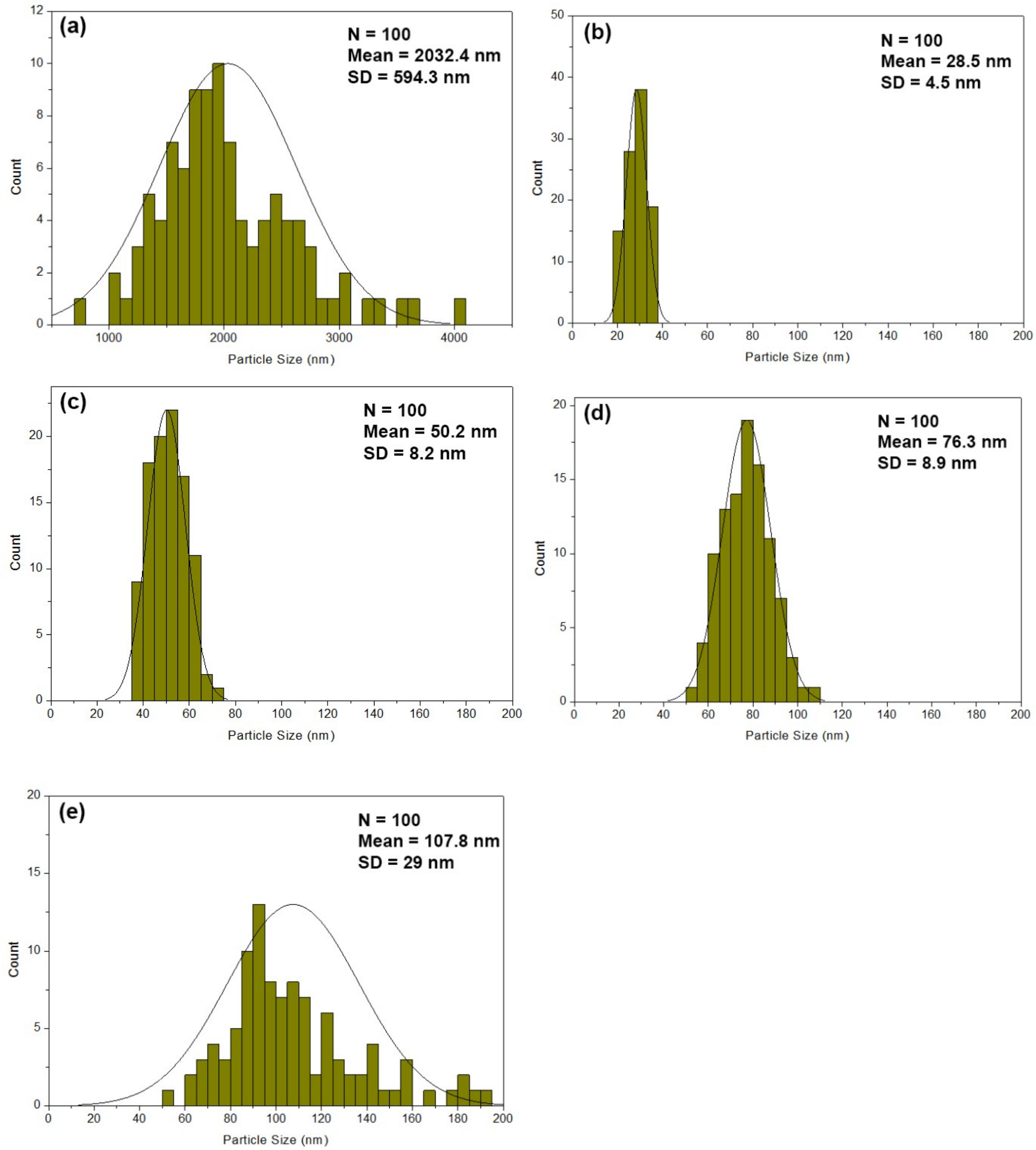

Figure S5 Particle distribution histogram for (a) AgCl (b) AgCl-10/CN (c) AgCl-30/CN (d) AgCl-50/CN (e) AgCl-70/CN

(5) UV-Vis band gap determination

The band gap energies (E_g) of CN and AgCl was obtained from the energy dependence equation of the absorption coefficient (α) for semiconductors

$$\alpha h\nu \propto (h\nu - E_g)^{\eta}$$

Where α, h, ν, E are absorption coefficient, Planck constant, light frequency and band gap energy respectively. This α can then be assumed to be proportional to the Kubelka-Munk function [F(R_∞)] and with an appropriate choice of η, a plot of $[F(R_\infty) \cdot h\nu]^{1/\eta}$ against hv is linear near the edge and the intercept of this line on $[F(R_\infty) \cdot h\nu]^{1/\eta}=0$ (x-intercept) gives the optical absorption edge energy E_g. The exponent η, value is determined by the type of optical transition upon photon irradiation. $\eta=2$ for indirect band gap semiconductors such as AgCl[1]. For all amorphous, polymeric materials, including CN, $\eta=2$ since they exhibit energy dependence similar to that found in indirect transitions[2].

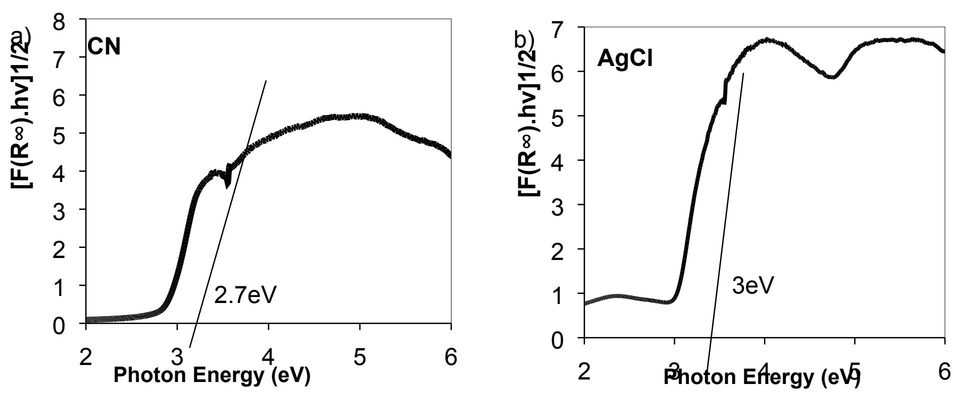

Figure S6. Kubelka-Munk transformed reflectance spectra of (a) carbon nitride (CN) and (b) silver chloride (AgCl)

Supporting References

1. K. Dai, L. Lu, J. Dong, Z. Ji, G. Zhu, Q. Liu, Z. Liu, Y. Zhang, D. Li and C. Liang, *Dalton Transactions*, 2013, **42**, 4657-4662.
2. L. Han, P. Wang, C. Zhu, Y. Zhai and S. Dong, *Nanoscale*, 2011, **3**, 2931-2935.