Electronic Supplementary Material (ESI) for ChemComm.

Fabrication of Protonated g-C_3N_4 Nanosheets as Promising Proton Conductive Materials

Table of contents

1. Material and methods

All chemicals were obtained from commercial sources and used as received without further purification. The g-C_3N_4 used in this work was prepared by the literature method of "*Adv. Funct. Mater.*, 2017, **27**, 1605785". Powder X-ray diffraction data were collected using Rigaku D/MAX-rA diffractometer with Cu Kα radiation (λ = 1.5418 Å). IR spectra (KBr pellets) were conducted on a Nicolet Impact 410 FTIR spectrometer in the range of 400-4000 cm^{-1}. Themo-gravimetric analysis with heating from room temperature to 800 ^oC was performed using a Netzsch STA 449c analyzer in a flow of N_2 with a heating rate of 10 ^oC min^{-1}. Elemental analysis (C, H, and N) was measured with a Euro EA3000 analyzer. The gas adsorption measurements were performed on ASAP 2020 apparatuses, after the sample was degassed for 4 h at 180 ^oC.

2. PXRD patterns of g-C_3N_4 and protonated g-C_3N_4 nano-sheets

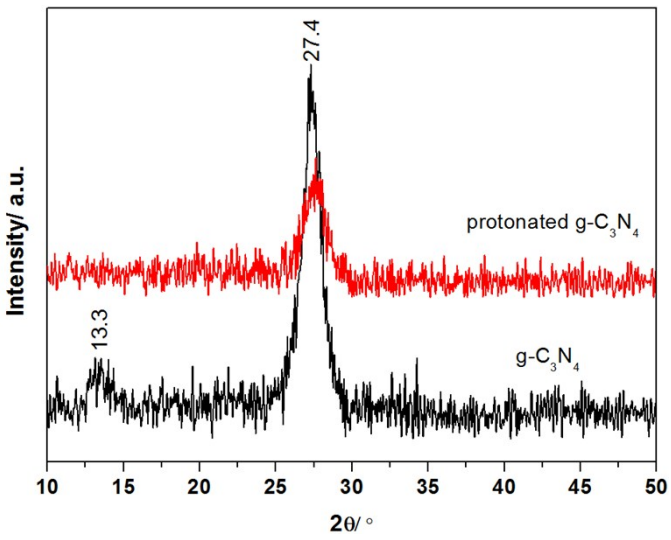

Figure S1. The PXRD patterns of g-C_3N_4 and protonated g-C_3N_4 nanosheets.

3. TEM images of protonated g-C_3N_4 nanosheets

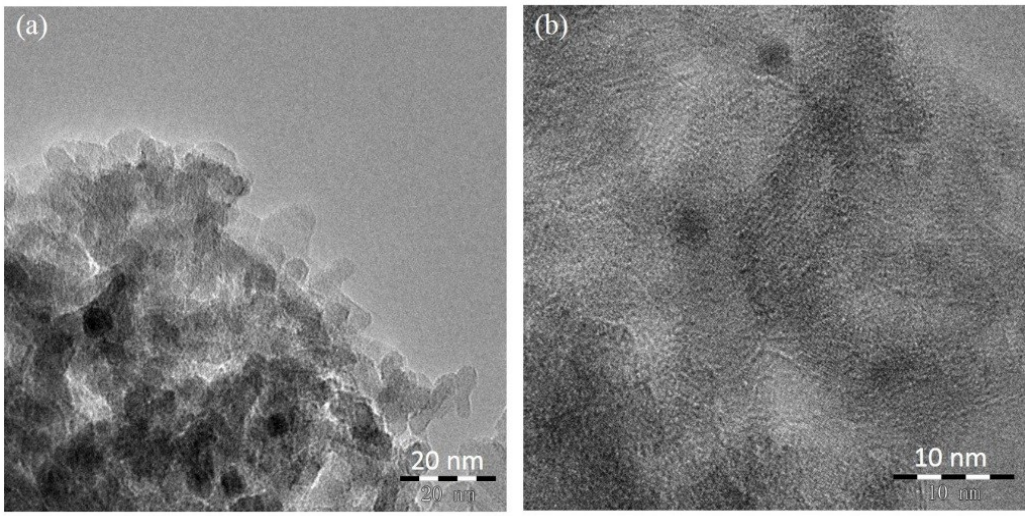

Figure S2. (a)&(b) TEM images of protonated g-C_3N_4 nanosheet.

4. FT-IR spectra of g-C_3N_4 and protonated g-C_3N_4

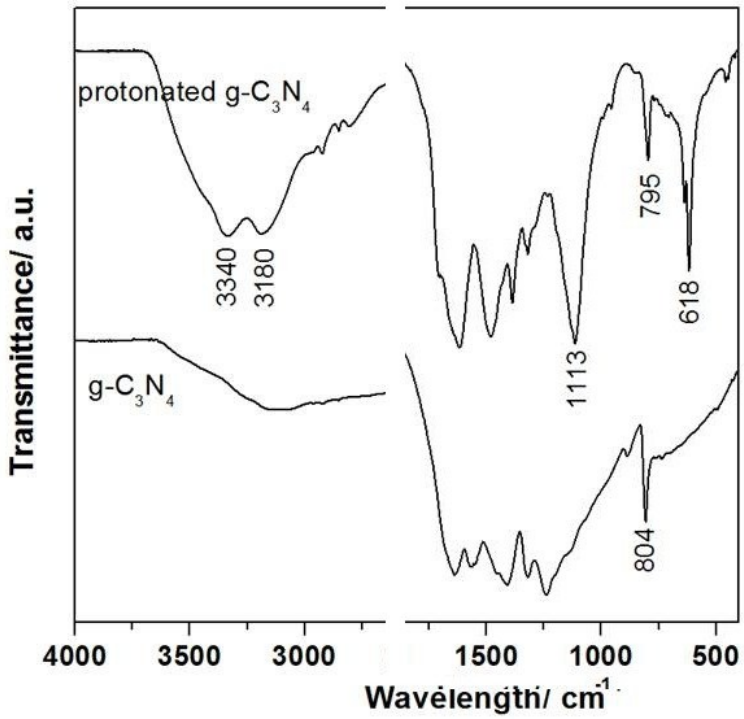

Figure S3. FT-IR spectra of g-C_3N_4 and protonated g-C_3N_4.

5. High resolution XPS spectra

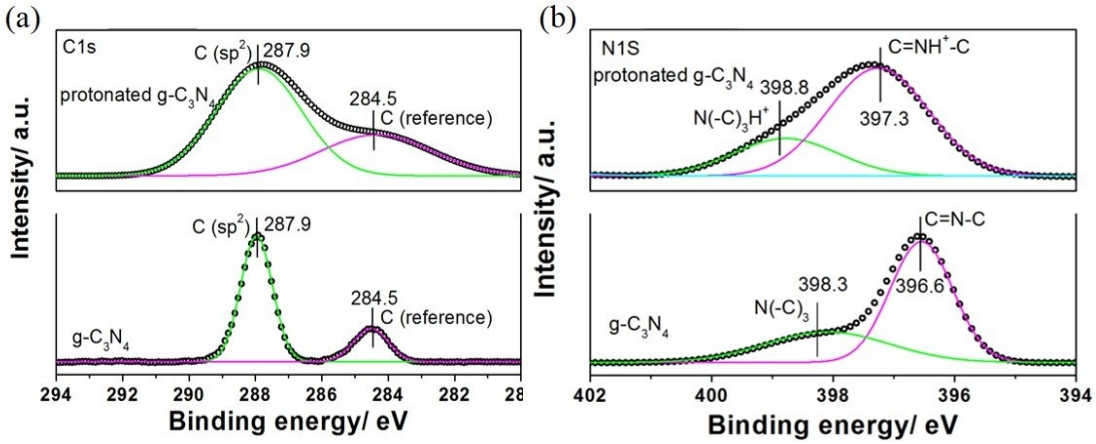

Figure S4. (a) & (b) the high resolution XPS C1s and N1s spectra of g-C_3N_4 and protonated g-C_3N_4 nanosheet, respectively.

6. Geometry optimization results

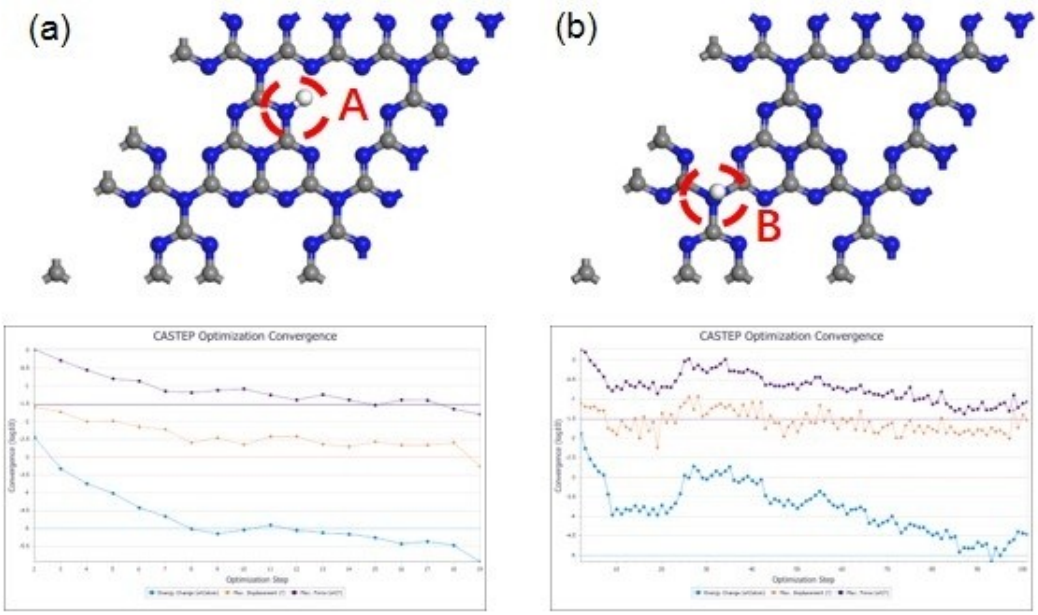

Figure S5. Geometry optimization results of protonated C_3N_4 when the protonated N was at A site(a) and B site(b).

7. The TG curves

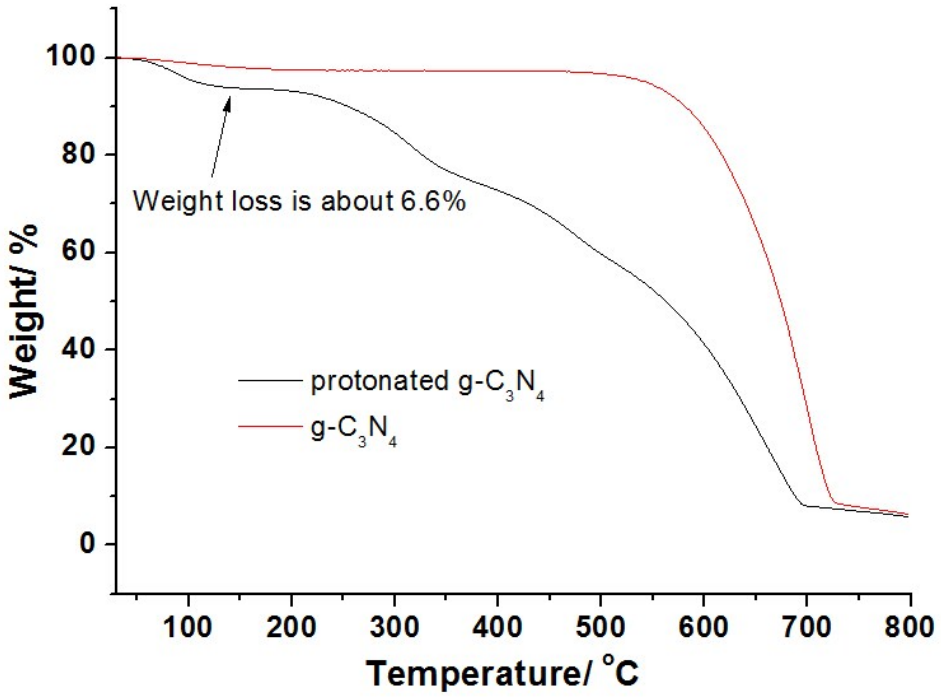

Figure S6. The TG curves of g-C_3N_4 and protonated g-C_3N_4 nanosheet.

8. Nyquist plots of g-C_3N_4 at room temperature and 98% RH

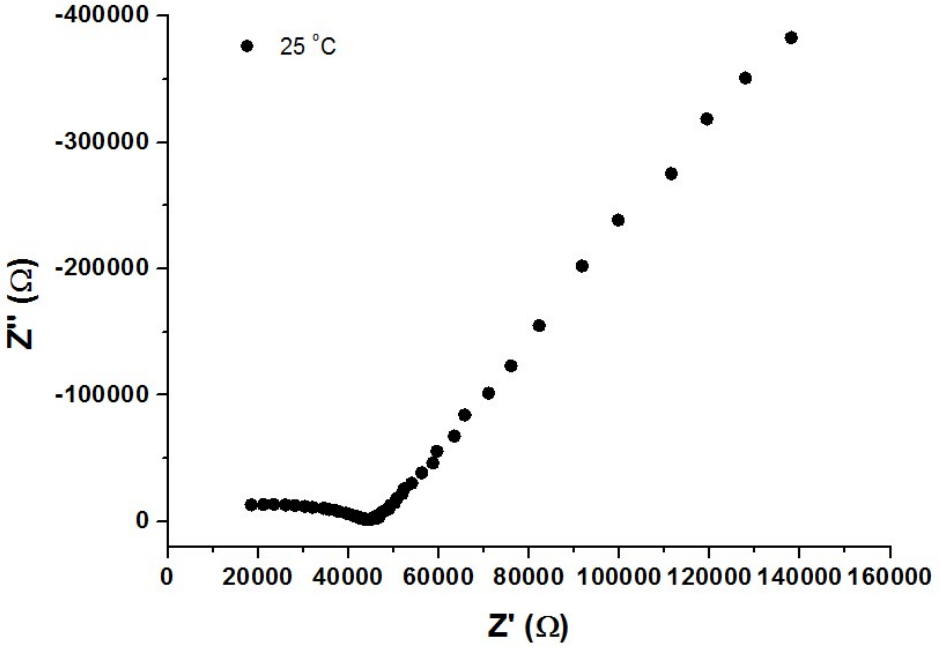

Figure S7. Nyquist plots of g-C_3N_4 under 98 % relative humidity and room temperature.

9. Activation energies (Ea)

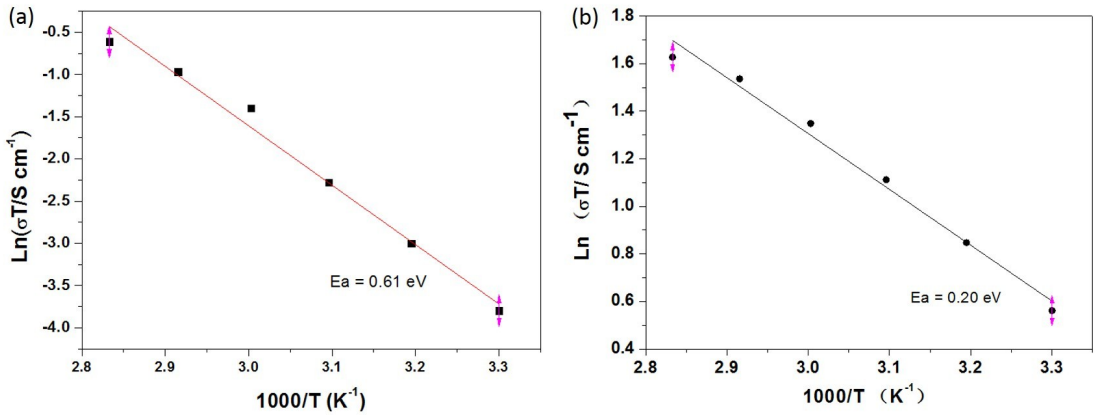

Figure S8. (a) & (b) the activation energies of g-C_3N_4 and protonated g-C_3N_4 under 98% RH from 25 to 80 °C.