

Supporting Information

***In-situ* Growth of Graphitic Carbon Nitride Films on Transparent Conducting Substrates via Solvothermal Route for Photoelectrochemical Performance**

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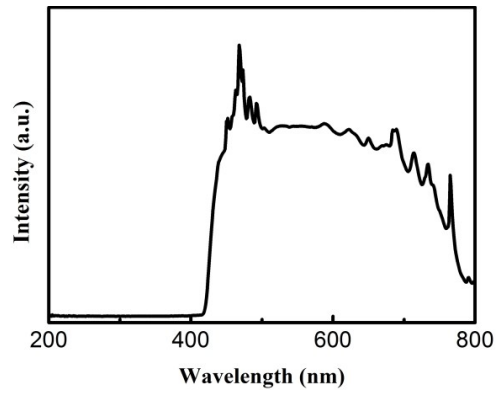


Figure S1. Spectrum of the Xe lamp with UV filter under 420 nm.

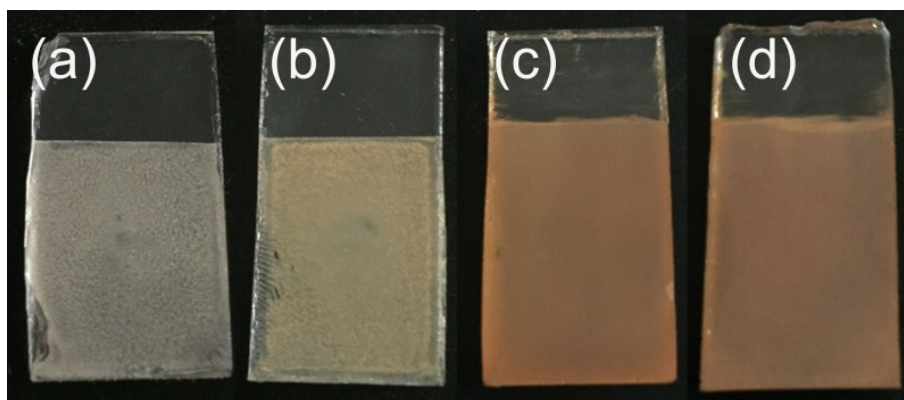


Figure S2. Photographs of films. (a) $g\text{-C}_3\text{N}_4$, (b) CN-p, (c) CN and (d) CN-h.

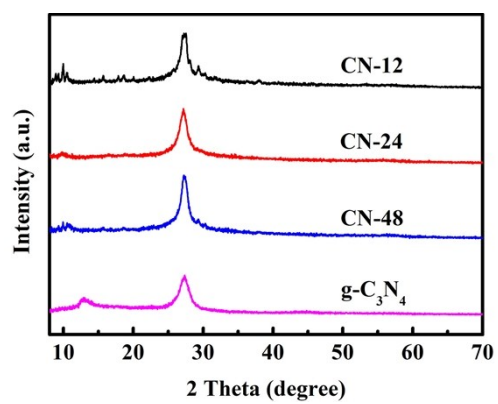


Figure S3. XRD patterns of carbon nitride under solvothermal reaction for 12h, 24h and 48h.



Figure S4. Photograph of carbon nitride film under solvothermal for 48h.

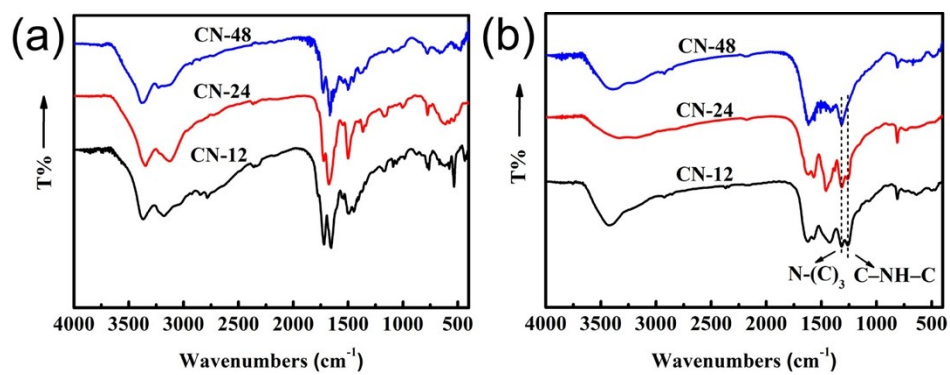


Figure S5. FTIR of samples under different solvothermal reaction time, (a) before annealing, (b) after annealing.

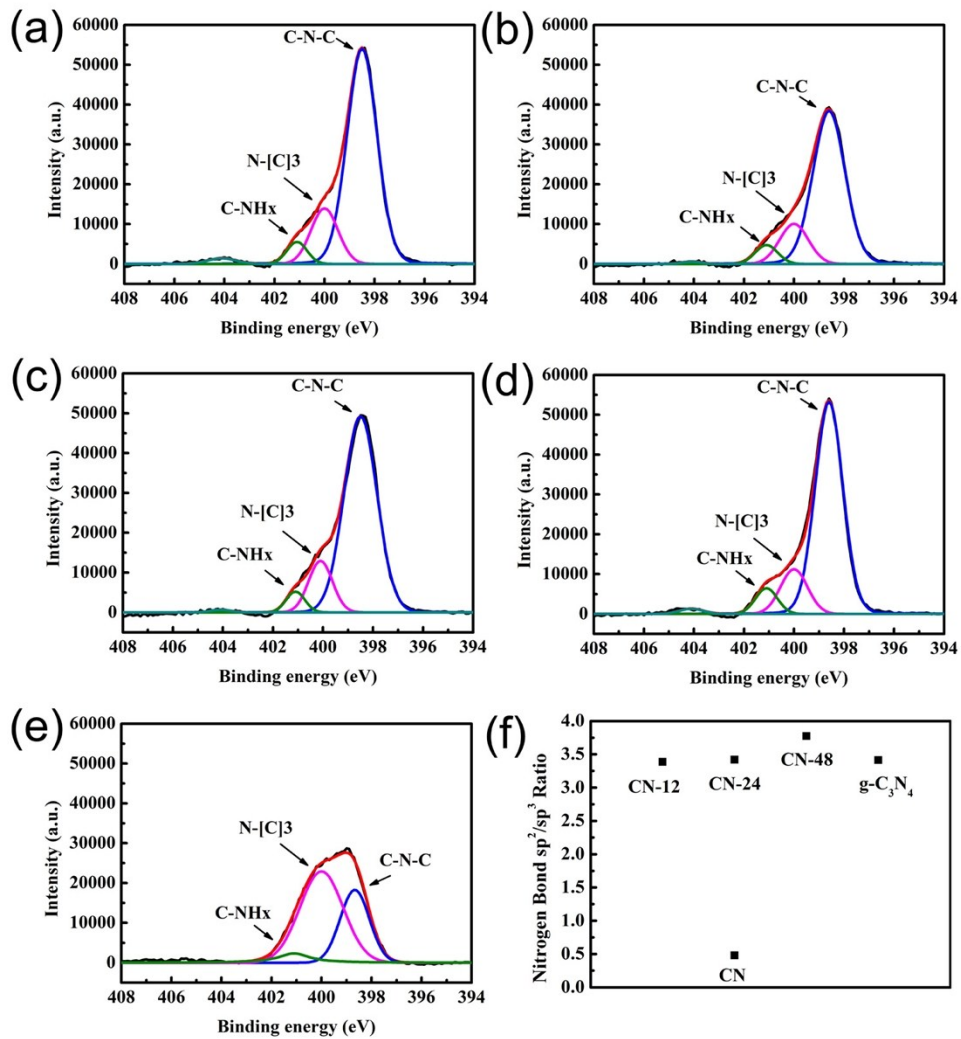


Figure S6. N 1s XPS spectra of (a) CN-12, (b) CN-24, (c) CN-48, (d) g-C₃N₄, (e) CN (Solvothermal for 24 h without annealing). (f) Nitrogen Bond ratio of sp^2/sp^3 . (Nitrogen of sp^3 including N-[C]3 and C-NH_x).

Table S1. Percentage breakdown of different bonds within the N1s spectrum.

N 1s		Atomic % the of sample in N 1s				
Bond types	Binding energy(eV)	CN-12	CN-24	CN-48	g-C ₃ N ₄	CN
C-N-C(sp ²)	398.6	75.8	76.9	78.5	76.1	32.5
N-[C]3(sp ³)	400.0	17.3	17.0	15.4	15.2	60.6
C-NH _x	401.1	5.1	5.5	5.4	7.1	6.9
`NO ₂	404.1	1.8	1.6	0.7	1.5	-



Figure S7. Photograph of film under solid-phase thermal condensation of the precursors.

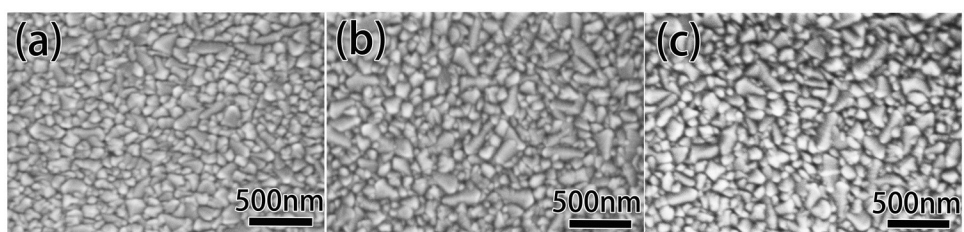


Figure S8. SEM images of bare FTO substrates, (a) before solvothermal, (b) after solvothermal, (c) after solvothermal and annealing processes.

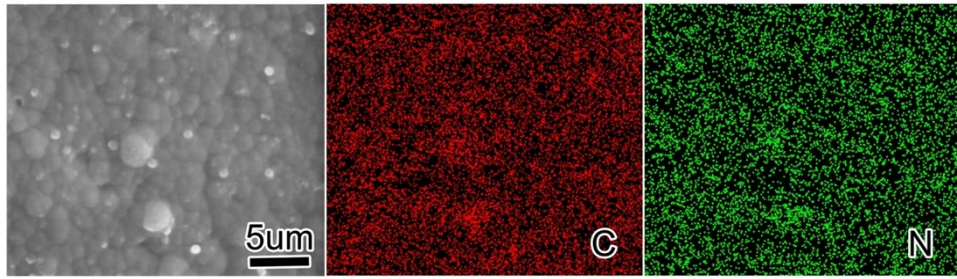


Figure S9. EDX mapping of CN-h sample.

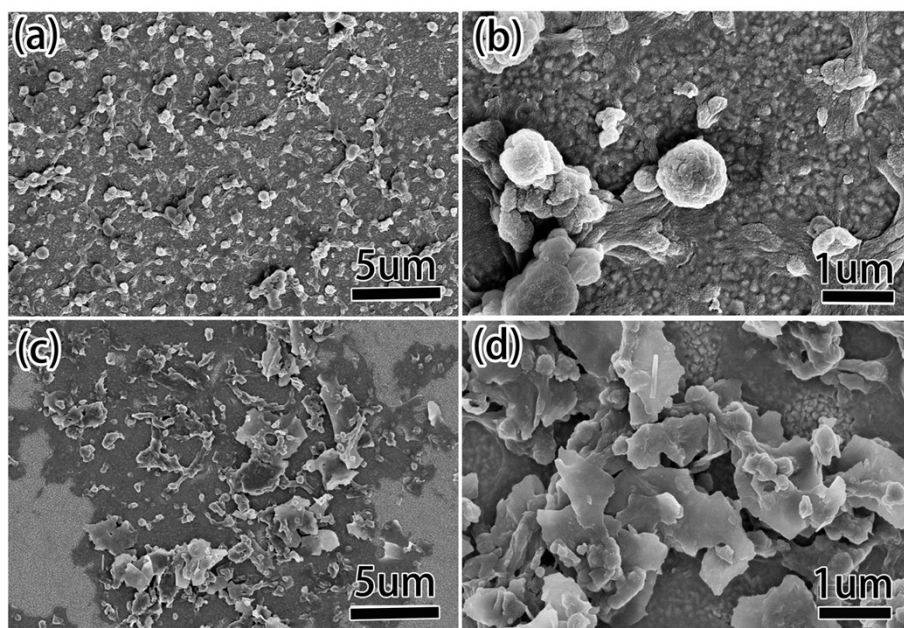


Figure S10. SEM images of carbon nitride films on FTO substrates after annealing at higher temperature or fast heating rate. (a) and (b) 540 °C, 1 °C /min, (c) and (d) 520 °C, 2 °C /min.