Supporting Information

Intercalated Graphitic Carbon Nitride: A Fascinating Two-Dimensional Nanomaterials for Ultra-Sensitive Humidity Nanosensor

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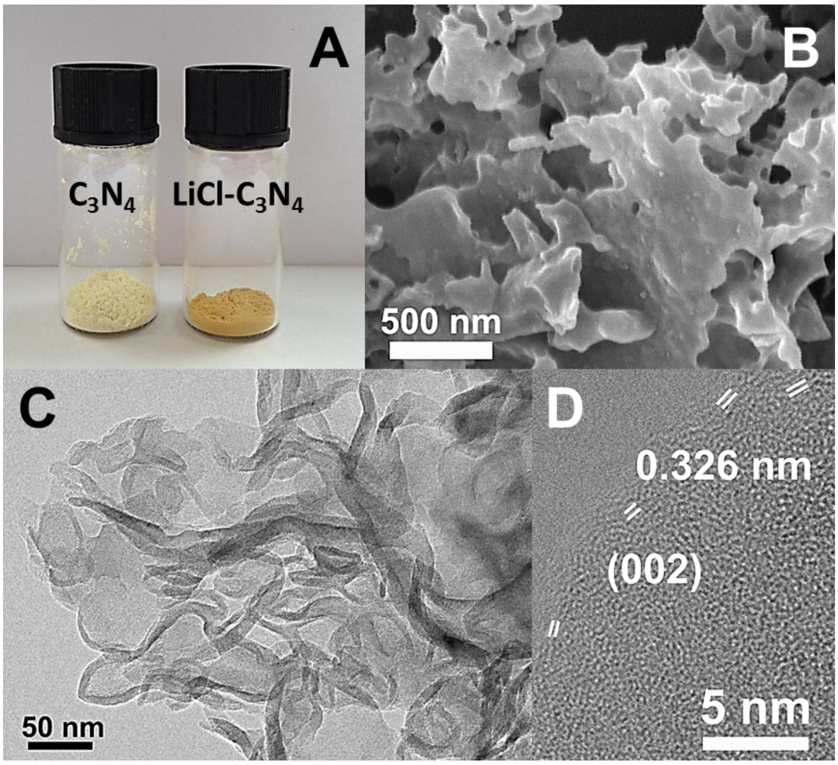

Figure S1. (A) Optical images of g-C_3N_4 nanosheets and 3.0 wt.% LiCl-intercalated g-C_3N_4 nanosheets; (B) SEM image of g-C_3N_4 nanosheets; (C) TEM image of g-C_3N_4 nanosheets; (D) HRTEM image of g-C_3N_4 nanosheets.

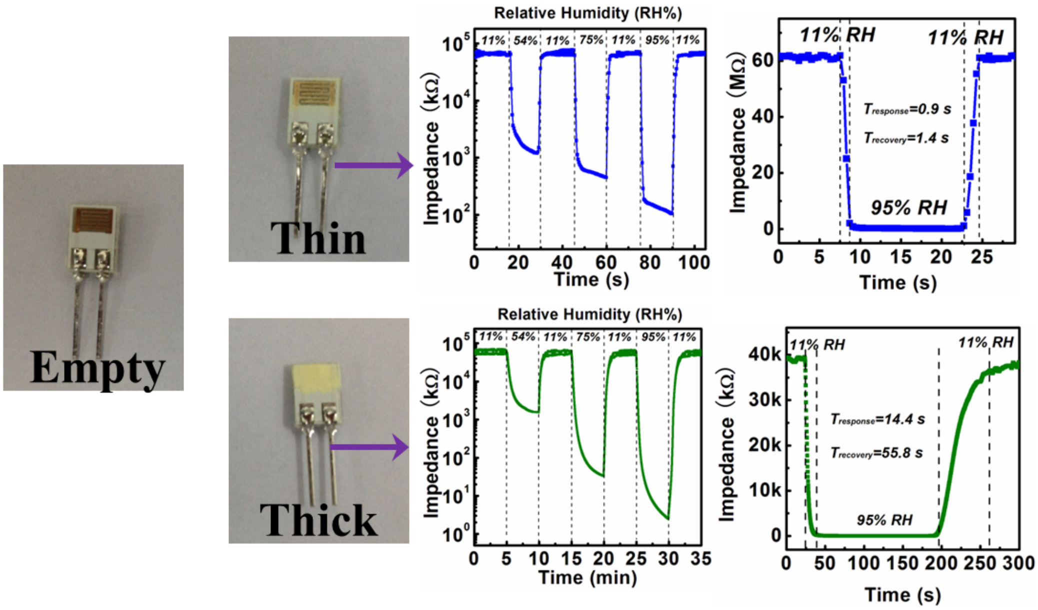

Figure S2. The optical images and the humidity sensing curves of the nanosensors with different thickness of LICN.

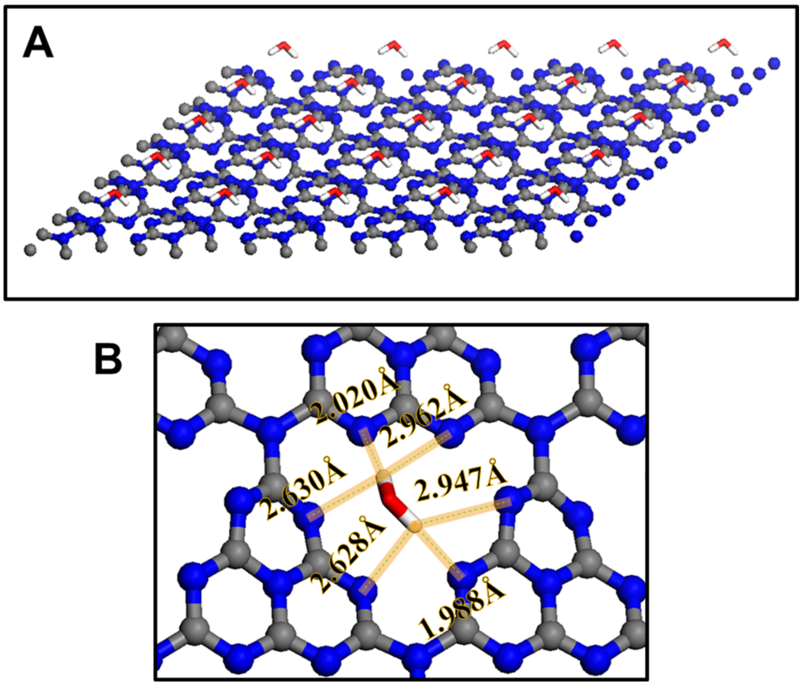

Figure S3. (A) Surface structure of the g-C_3N_4 nanosheets after absorbing water; (B) the interaction between the water and the "nitrogen pots" of g-C_3N_4 nanosheets.

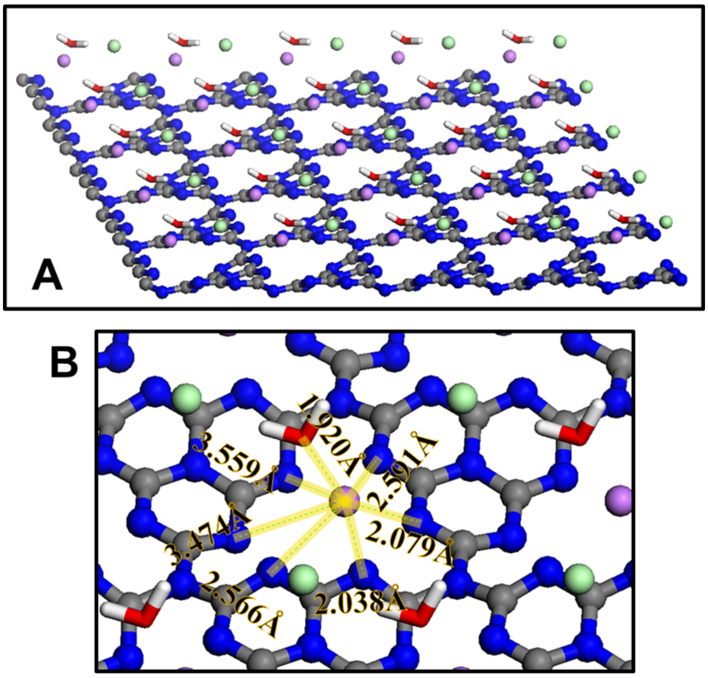

Figure S4. (A) Surface structure of the LiCl-intercalated g-C_3N_4 nanosheets after absorbing water; (B) the interaction between the water and the Li species around the "nitrogen pots" of LiCl-intercalated g-C_3N_4 nanosheets.

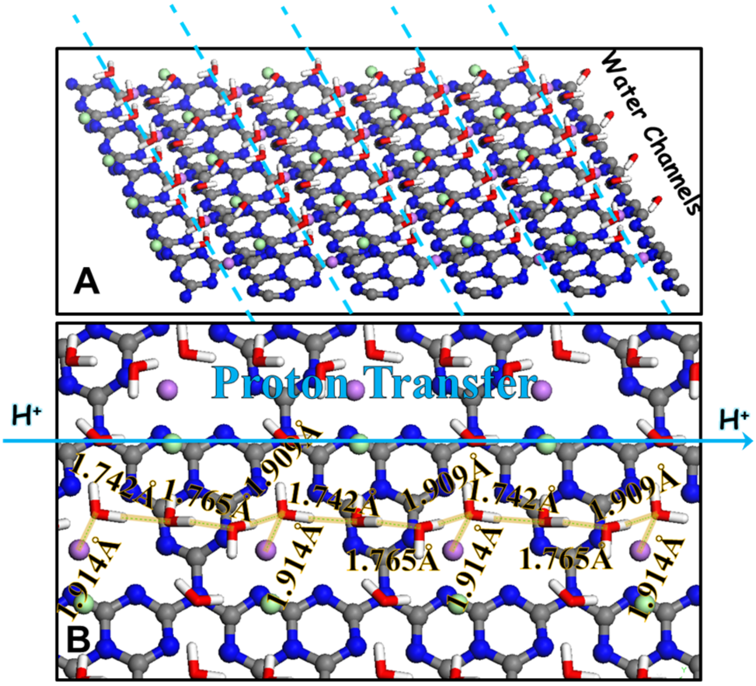

Figure S5. (A) Surface structure of the LiCl-intercalated g-C_3N_4 nanosheets after absorbing water channels; (B) the interactions of water molecules in one water channel.

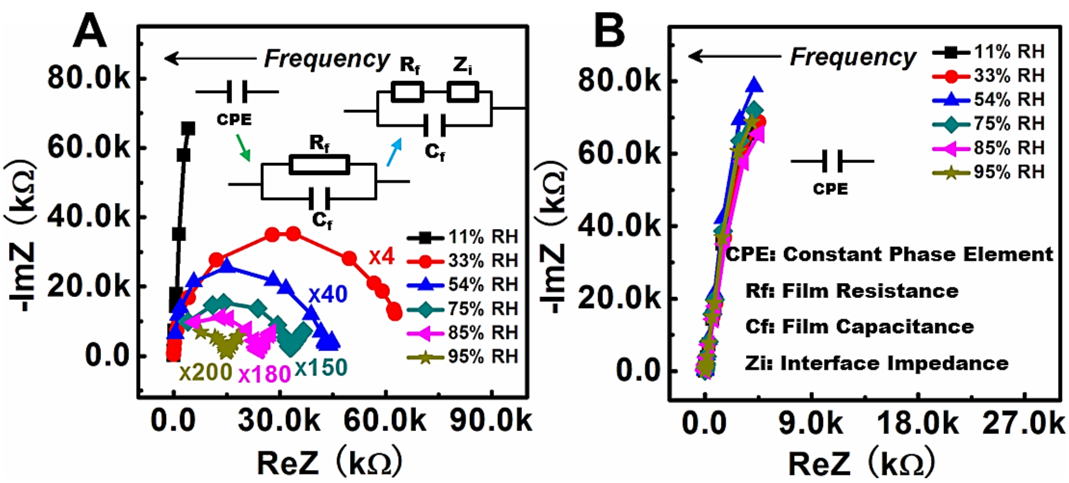

Figure S6. Complex impedance plots of the as-fabricated nanosensors based on (A) 3.0 wt.% LiCl-intercalated g-C_3N_4 nanosheets and (B) g-C_3N_4 nanosheets at different relative humidity.

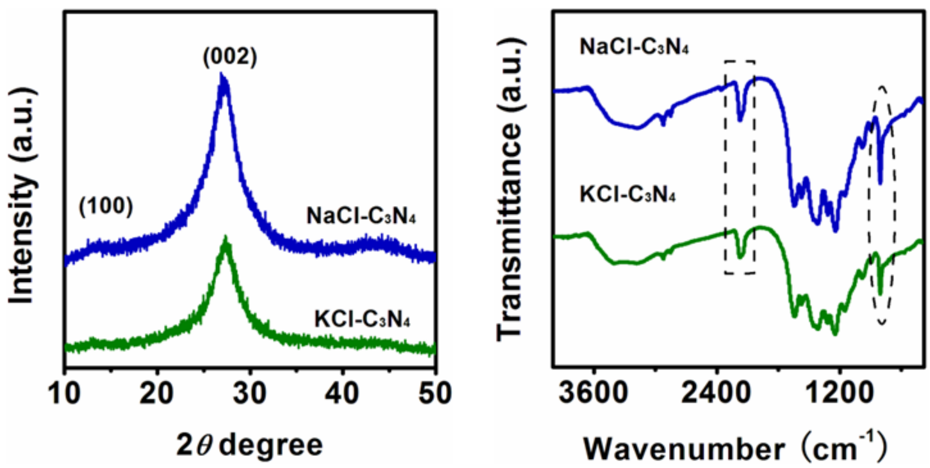

Figure S7. XRD patterns and FT-IR spectra of the NaCl- or KCl- intercalated C_3N_4 nanosheets. The results are similar with these of LiCl-C_3N_4 nanosheets, indicating the formation of NaCl- and KCl- intercalated C_3N_4 nanosheets, respectively.

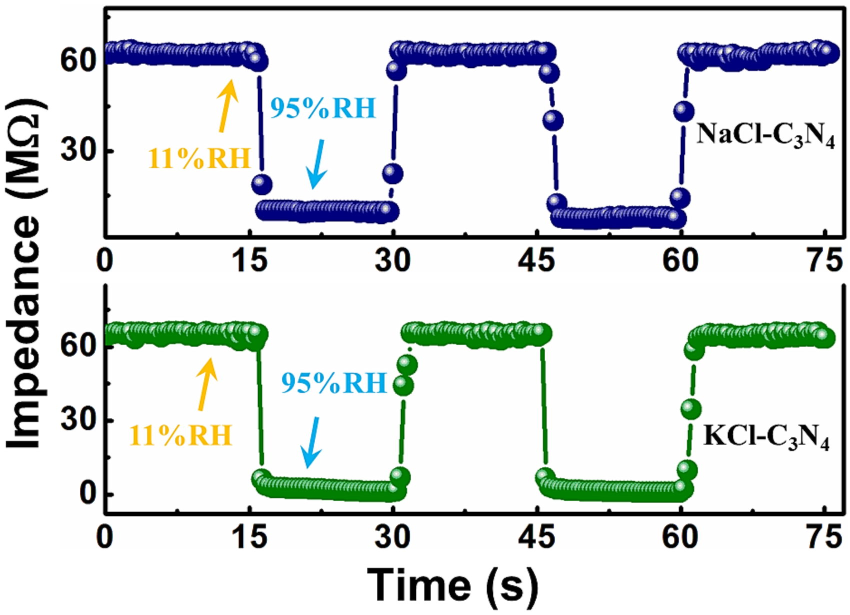

Figure S8. Response and recovery characteristic curves of the nanosensors based on NaCl-intercalated g-C_3N_4 nanosheets and KCl-intercalated g-C_3N_4 nanosheets.

Table S1. Theoretical calculation results of the surface energy and adsorption energy under different conditions.

	Energy (eV)	Adsorption Energy [a] (kJ/mol)
H_2O	-14.22	
C_3N_4	-473.53	
$H_2O+C_3N_4$	-488.13	-36.66
$LiCl/C_3N_4$	-501.40	
H_2O +$LiCl/C_3N_4$	-516.11	-47.28
Water channel + $LiCl/C_3N_4$ [b]	-560.55	
Hydrogen bond [c]	-0.21 (-20.26 kJ/mol)	

[a] The adsorption energy was obtained by the equation as follow: $E_a = E_o-(E_w+E_s)$ where E_o is the surface energy after absorbing a water molecule; E_w is the energy of one water molecule in vacuum; E_s is the surface energy of the sample.

[b] The water channel was consisted of one chemical absorbed water molecule and two physical absorbed water molecules, as shown in Figure 4E.

[c] The energy of hydrogen bond was determined by the following equation: $E_{H\text{-}bond} = [E_{wc} - (E_{oLi} + 3 \times E_{aCN} + 3 \times E_w)]/3$, where E_{wc} is the surface energy of $LiCl/C_3N_4$ absorbing a water channel; E_{oLi} is the surface energy of $LiCl/C_3N_4$ absorbing a water molecule; E_{aCN} is the energy of C_3N_4 for absorbing one water molecule; E_w is the energy of one water molecule in vacuum.