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Supporting information

Band gap tailoring and visible-light-driven photocatalytic performance of porous $(GaN)_{1-x}(ZnO)_x$ solid solution

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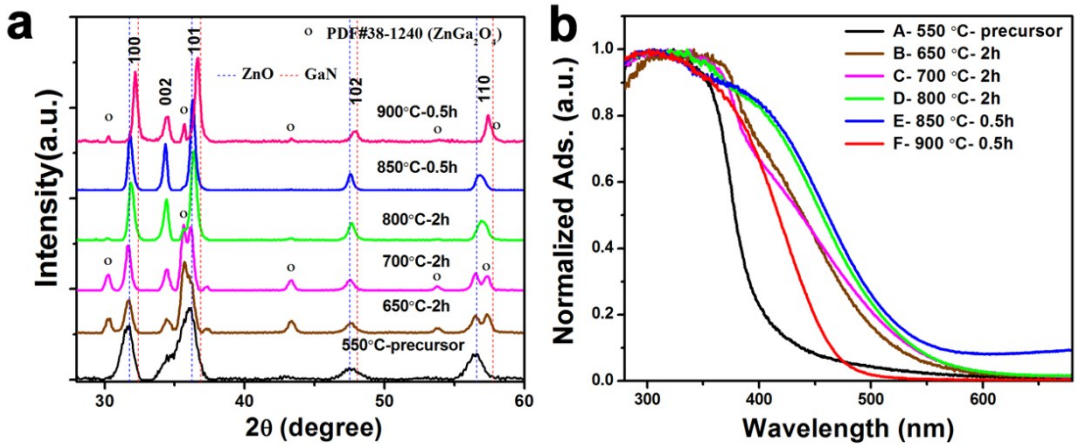

Fig. S1 (a) XRD patterns of the obtained samples dependent on a series of temperatures. (b) The corresponding UV-visible diffuse reflectance spectra of the temperature-series of samples.(The molar ratio Zn/Ga of Zn-Ga-O precursor was fixed at 6/4.)

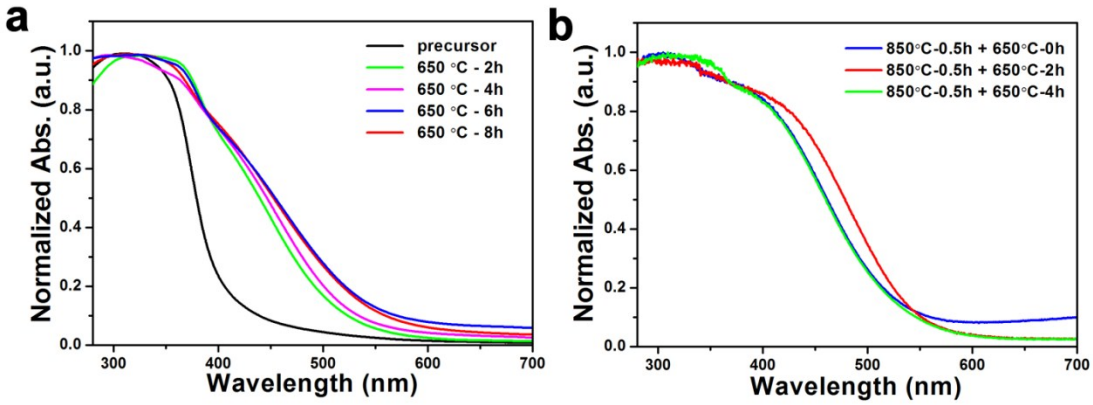

Fig. S2 UV-visible diffuse reflectance absorption spectra of (a) time-series of as-synthesized samples at the low temperature of 650 °C and (b) obtained $(GaN)_{1-x}(ZnO)_x$ samples at 850 °C for 0.5 h with follow-up nitridation process at 650 °C.

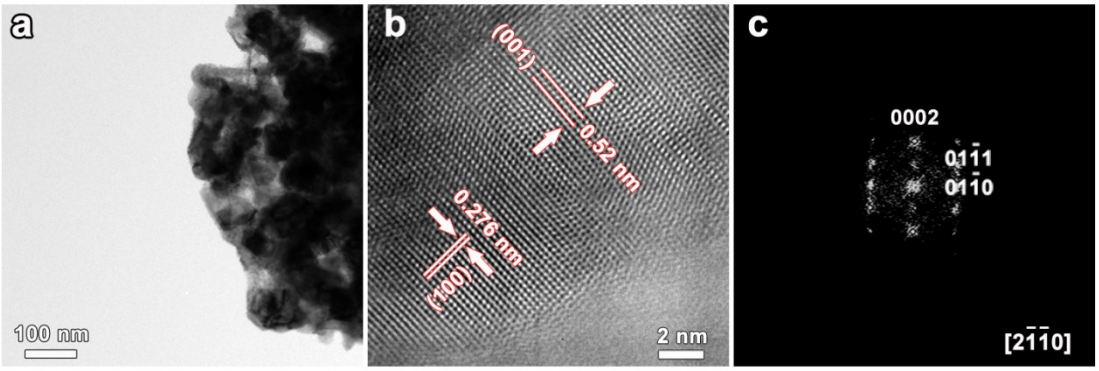

Fig. S3 (a) Bright-field TEM image (b) HRTEM image and (c) the Fast Fourier Transformation patterns (FFT) from the HRTEM image of $(GaN)_{0.35}(ZnO)_{0.65}$ solid solution.

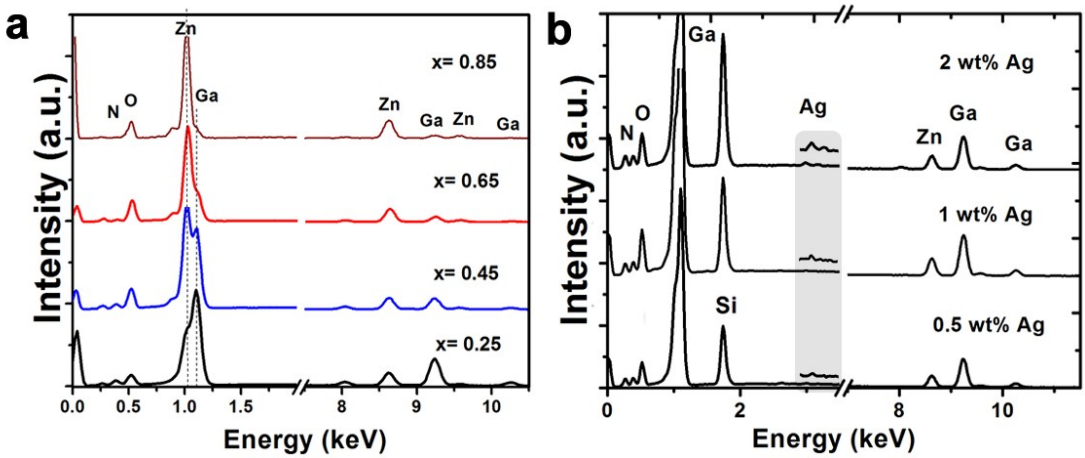

Fig. S4 (a) EDS spectra of $(GaN)_{1-x}(ZnO)_x$ solid solution with different ZnO solubility: x=0.25, x= 0.45, x= 0.65, x= 0.85. (b) EDS spectra of $(GaN)_{0.75}(ZnO)_{025}$ solid solution with different content of Ag: 0.5 wt%, 1 wt%, 2 wt%.

Table S1 Quantitative composition results based on EDS spectra shown in Fig. S4.

Spectrum No		Atom percentage (at%)				Average
		Ga	Zn	O	N	Zn/(Zn+Ga)%
850 °C / 60min (5/5)	Point 1	36.03	12.08	25.90	25.99	25%
	Point 2	29.03	9.75	30.29	30.93	
850 °C / 30min (5/5)	Point 1	21.52	18.01	36.54	23.92	45%
	Point 2	23.16	18.20	33.77	24.87	
850 °C / 30min (6/4)	Point 1	13.93	26.51	48.83	10.73	65%
	Point 2	12.50	24.99	48.59	13.92	
850 °C / 30min (9/1)	Point 1	7.87	41.12	45.07	5.93	85%
	Point 2	7.75	44.76	43.79	3.70	

Table S2 The photocatalytic performance of some representative visible-light-sensitive photocatalysts on the degradation of phenol.

Photocatalyst	Phenol concentration (mg/L)	Experiment conditions	Photocatalyst content (g/L)	Phenol degradation rate (%)	Ref
g-C_3N_4/CDs	10	λ > 400 nm 100 mW/cm^2	1.00	After 200 min irradiation: 100	1
N-doped TiO_2	50	λ > 400 nm (350 W) / sunlight	1.00	After 100 min / 420 min (sunlight) irradiation: 100	2
Ce-doped ZnO	20	55W fluorescent lamp	1.00	After 300 min irradiation: 80.7	3
Ag@TiO_2	10	Sunlight	1.00	After 300 min irradiation: 44.9	4
$BiVO_4$/Ag /AgCl	25	λ > 420 nm 500 W Xe lamp	0.50	After 180 min irradiation: 43.0	5
Ag@AgBr/ Cu_2O	15	λ > 420 nm 250 W halide lamp	1.00	After 120 min irradiation: 60.0	6
$(GaN)_{1-x}(ZnO)_x$/Ag	10	λ > 400 nm 100 mW/cm^2 /sunlight	1.00	After 60 min irradiation: 92.7 / 96.6 (sunlight)	This work

Supplementary reference

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