

Growth of Small Sized CeO₂ Particles in the Interlayers of Expanded Graphite for High-Performance Room Temperature NO_x Gas Sensor

Ying Yang,^{a**b**} Chungui Tian,^a Li Sun,^a Renjiang Lü,^{a**b**} Wei Zhou,^a Keying Shi,^{a*} Kan Kan,^a Jingchao Wang,^a and Honggang Fu^{a*}

^a Key Laboratory of Functional Inorganic Material Chemistry, Ministry of Education.

Key Laboratory of Physical Chemistry, School of Chemistry and Chemical Engineering, Heilongjiang University, Harbin 150080, P. R. China.

^b College of Chemistry and Chemical Engineering, Qiqihar University, Qiqihar 161006, P. R. China.

Tel: (+86) 451 8660 9115; Fax: (+86) 451 8666 1259;

E-mail address: E-mail: fuhg@vip.sina.com (H. G. Fu); shikeying2008@yahoo.cn (K. Y. Shi)

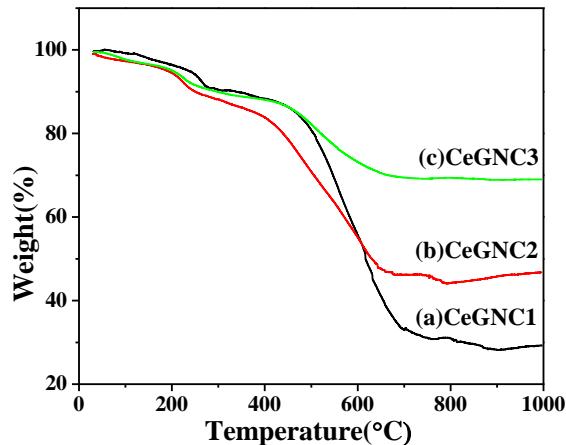


Fig. S1 Thermogravimetric analysis (TGA) of as-obtained CeO₂/graphene-like nanosheet composites with different CeO₂ contents (a) CeGNC1 (b) CeGNC2 and (c) CeGNC3.

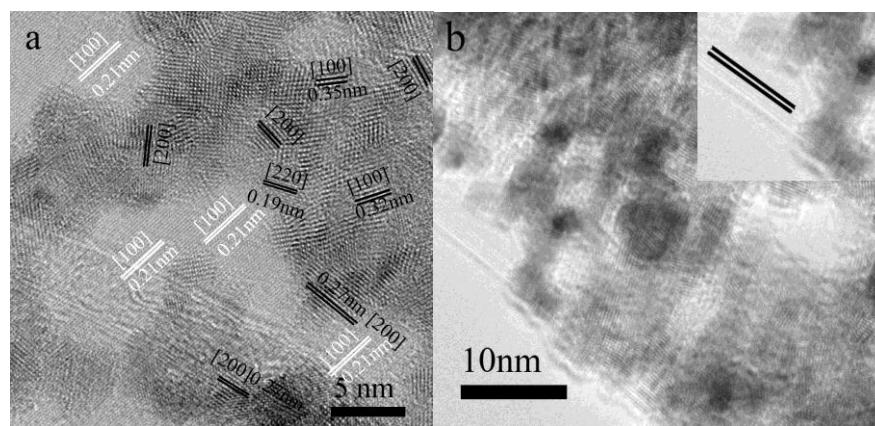


Fig. S2 TEM images of different selected-area of CeGNC2 (a) HRTEM image of CeGNC2; graphene-like nanosheet (100) and CeO₂ (111), (200), (220) can be seen; (b) TEM image of part of CeGNC2, the inset shows HRTEM image of a multilayer graphene-like nanosheet edge.

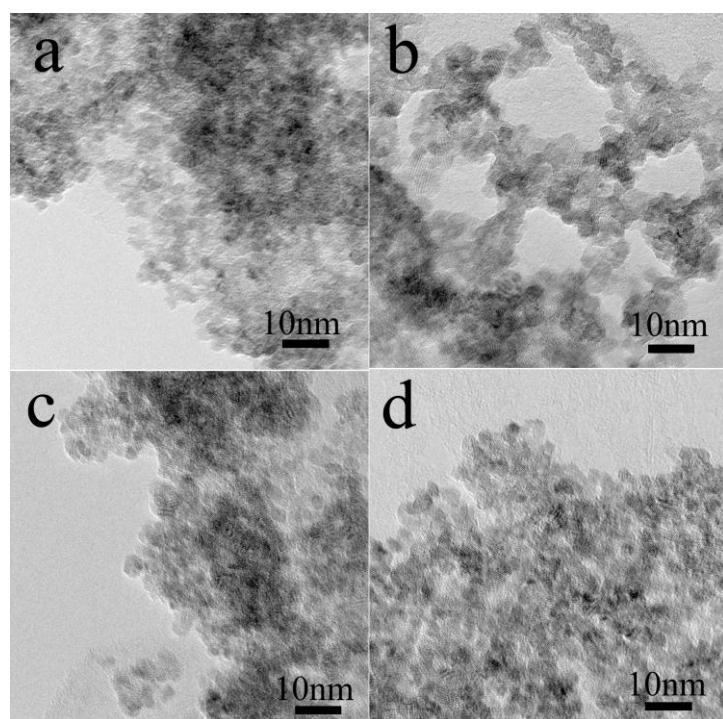


Fig. S3 TEM images of different selected-area of CeGNC2 showing porous assemble of CeO_2 nanoparticles.

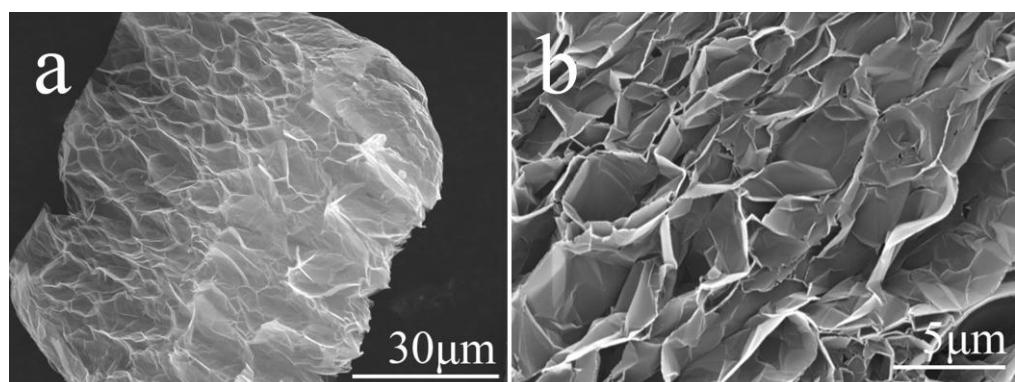


Fig. S4 SEM images of the pure expanded graphite (EG).

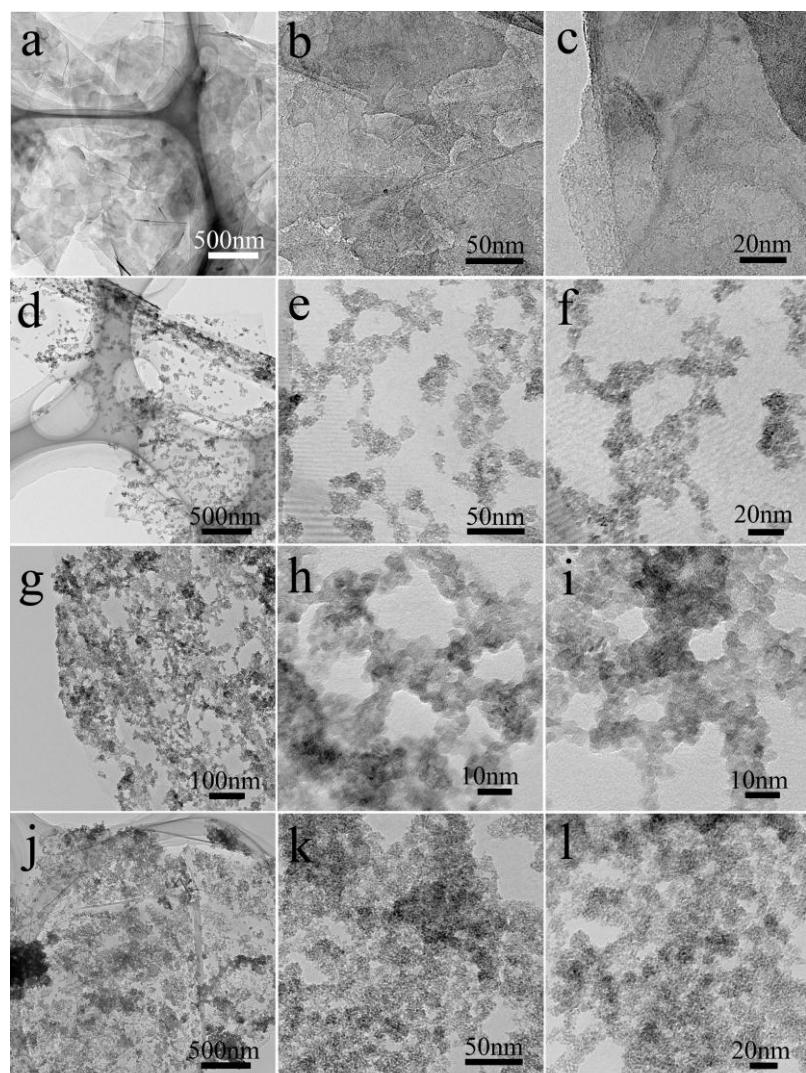


Fig. S5 TEM images of (a-c) pure EG; (d-f) CeGNC1; (g-i) CeGNC2; (j-l) CeGNC3.

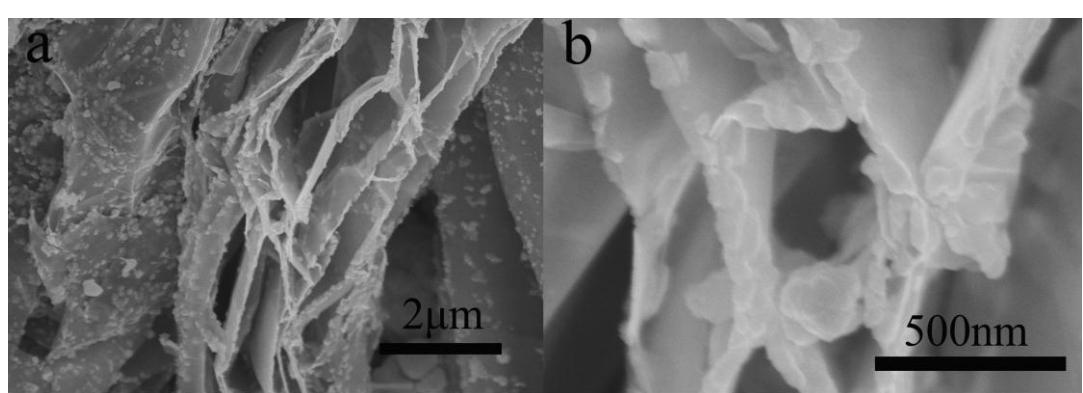


Fig. S6 Low- and high-magnification SEM images of (a, b) CeO_2 /graphene-like nanosheet composites by using ethanol as solvent

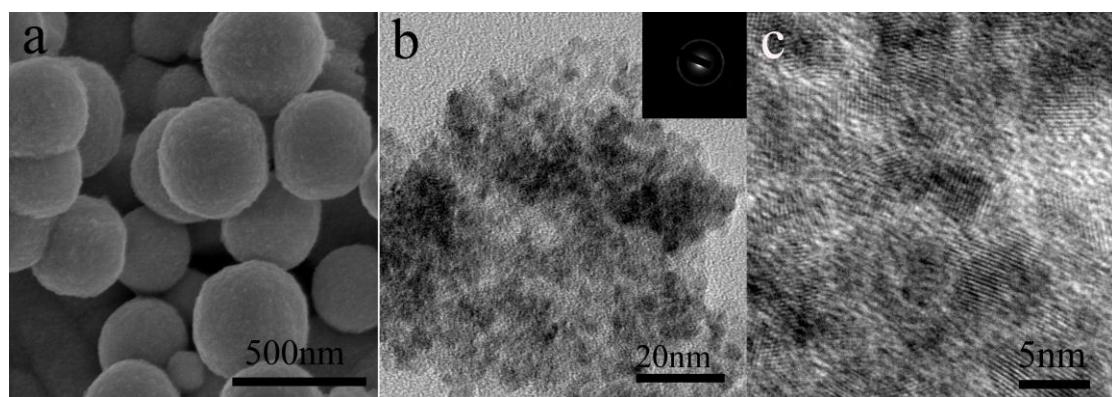


Fig. S7 (a)SEM image of the pure CeO_2 obtained by solvothermal method at 180 °C for 4 h; (b)TEM image of the the pure CeO_2 , the inset is the corresponding SAED pattern; (c) HRTEM image of the the pure CeO_2 .

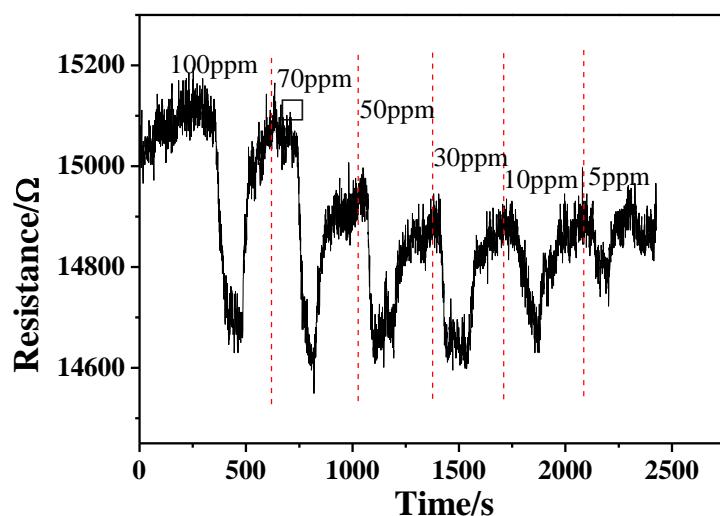


Fig. S8 The representative response–recovery cyclic curves of the synthesized CeO_2

Table S1 The sensitivity and response time of the synthesized CeO_2 sensor to 100~10 ppm NO_x at room temperature in air(temperature 22 °C; relative humidity 26 %)

Volume concentration/ppm	100	70	50	30	10	5
Sensitivity/%	2.25	2.12	1.95	1.87	1.48	0.96
Response time/s	28.0	30.7	47.3	56.0	73.0	74.7

Table S2 The sensitivity and response time of the CeGNC2 sensor to 300~5 ppm NO_x at room temperature in air(temperature 22 °C; relative humidity 26 %)

Volume concentration/ppm	300	200	100	70	50	30	10	5
Sensitivity/%	12.76	11.49	10.39	8.94	9.54	8.19	4.85	3.78
Response time/s	1.30	4.00	7.33	6.00	6.66	8.67	14.67	18.80

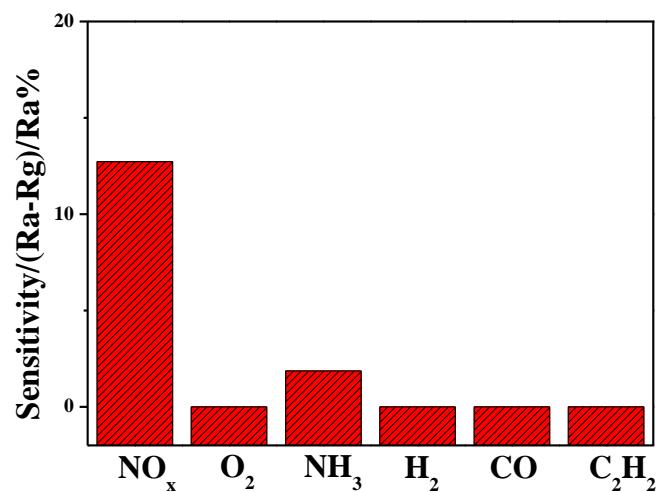


Fig. S9 Response of the CeGNC2 sensor to 100 ppm different gases at room temperature in air (temperature 22 °C; relative humidity 26 %)

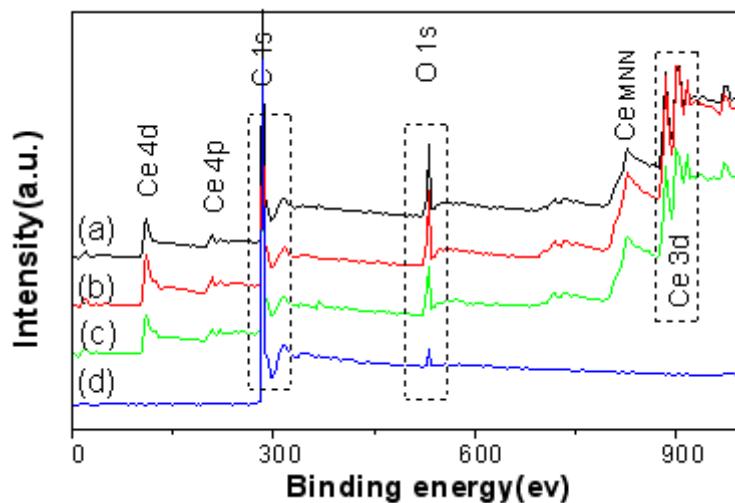


Fig. S10 (A)Broad XPS spectra of (a) CeGNC1, (b) CeGNC2, (c) CeGNC3, (d) EG;