

Electronic Supplementary Information

Graphene / carbon composite nanofibers for NO oxidation at room temperature

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Instrument

The morphologies of the carbonized and activated PCNFs and PGCNFs were examined by SEM in a LEO-1530. XRD (Rigaku D/Max 2500PC, Japan) and Raman spectroscopy (Renishaw Invia RM200, England) were used to examine the structural properties of different samples. The functional groups of the samples were evaluated using FT-IR. An atomic force microscopy (AFM) was used to obtain the lateral dimension and thickness of as-prepared GO. The specific surface areas and pore-size distributions of the samples were analyzed by physical adsorption of gases (N₂ at 77K) in volumetric adsorption systems (BELSORP-max, BEL, Japan). All samples were degassed at 195°C for 18h prior to the adsorption measurements. The total micropore volume (pores smaller than 2 nm) was calculated by applying the Horvath–Kawazoe (HK) equation. The specific surface areas of all samples were measured in a relative pressure interval of 0.05–0.30 by using the BET method. The micropore size

distributions were calculated by applying the non-local density functional theory (NLDFT) to the N_2 isotherms using the Bel analysis software.

Details of NO oxidation tests

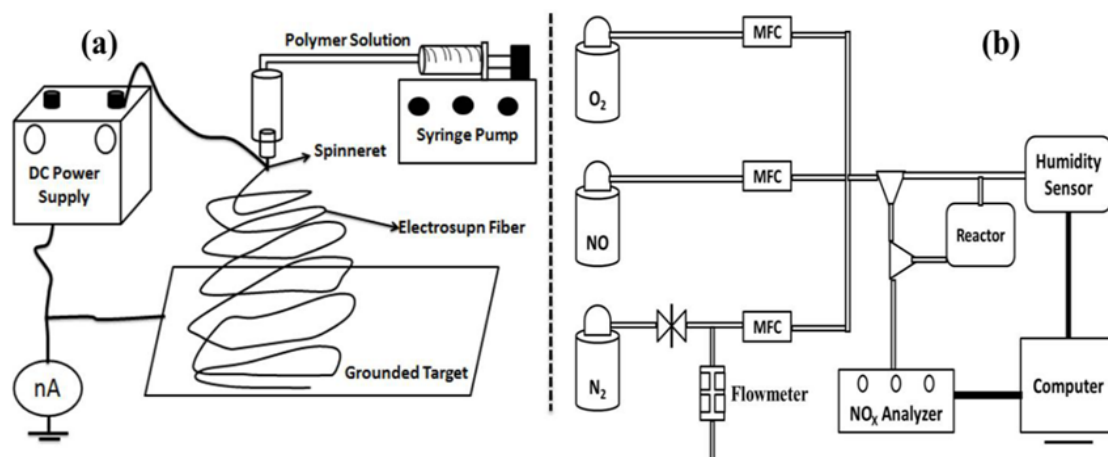


Fig S1 Schematic of the experimental equipment (a) for electrospinning and (b) for testing NO catalytic oxidation

Figure S1 displays the schematic diagram of the experimental setup to measure NO oxidation. In the mixed gas section, three electronic mass flow controllers (MFCs) were used to control and measure the flow rates of O₂, N₂, and NO. Mixture streams were set at a desired concentration level and emitting from stainless steel gas-mixing chamber. A quartz tubular reactor (L = 100 mm, i.d. = 5 mm) was filled with samples. The temperature was controlled via a water bath with a thermostat. The NO_x analyzer (*42i model, Thermo electron Co., USA*) was used to detect the concentrations of NO and NO₂. The desired sample quantities (0.05 – 0.10 g) were packed in the tubular reactor. The reactor was maintained at the desired reaction temperature in a water bath. The required gas flow rates were adjusted using MFCs to obtain the desired concentrations. The O₂ content was adjusted to 21 vol %. The inlet and outlet

concentrations of the gases were measured by the NOx analyzer wherein the data obtained remains available for further analysis. In this study the inlet concentration was set at 50 ppm.

The N₂ adsorption-desorption isotherms and pore size distribution of PCNF and PGCNF

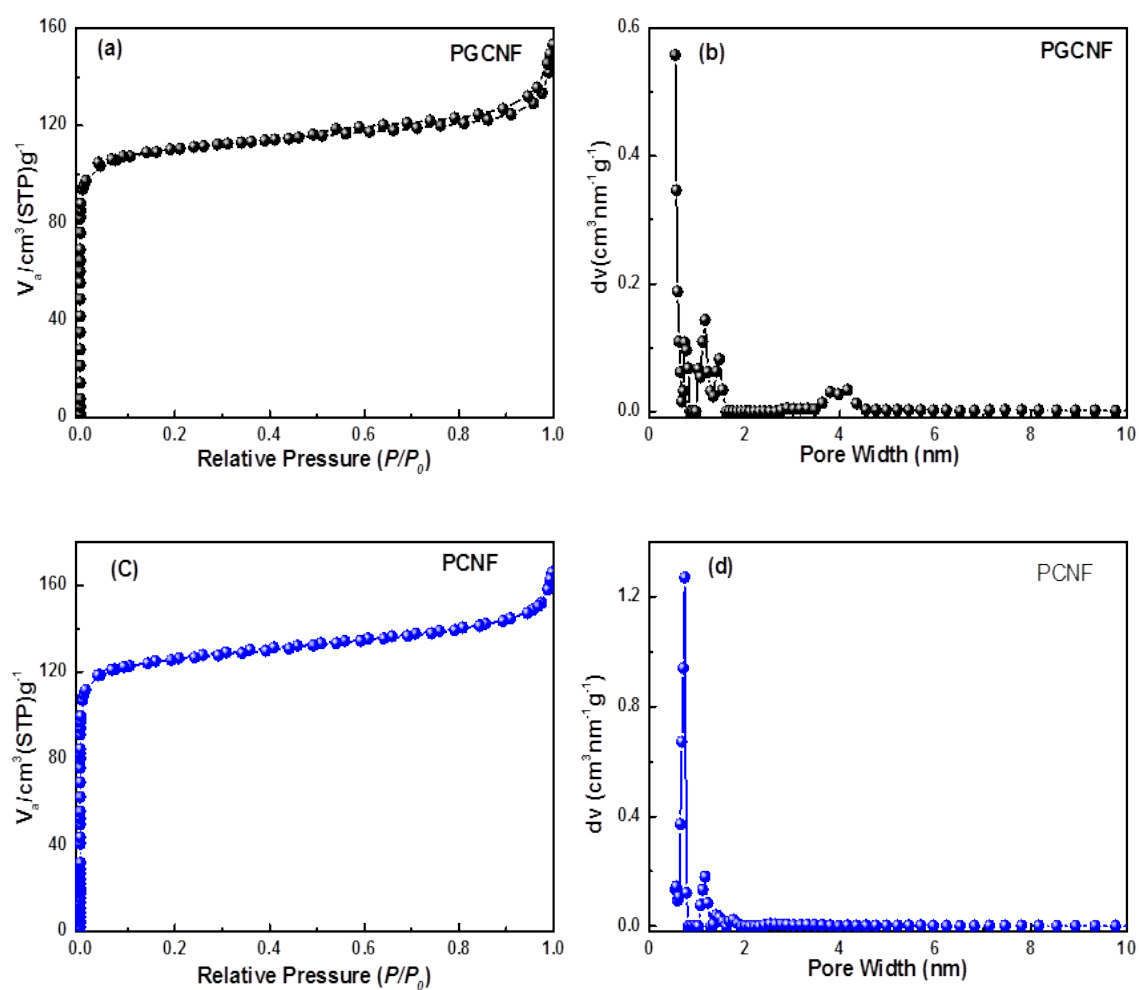


Fig S2. The N₂ adsorption-desorption isotherms and pore size distribution. (a), (b) for PGCNF and (c), (d) for PCNF.

Figure S2 shows the isotherms of the PCNF and PGCNF sample. Both of the isotherms are type I isotherms according to the International Union of Pure and Applied Chemistry classification system, which represent the adsorption characteristics of the micropores. The isotherms of PGCNF displays some little hysteresis loop at high relative pressure compared to the PCNF, which indicates that the addition of rGO produce some tiny mesopores, and some mesopores were confirmed in pore size distribution of PCNF. The pore size distributions of two samples pores were calculated by NLDFT and are shown in Figure S2 b and d. The distribution reveals that the PCNF and PGCNF samples possess multimodal microporous structures while the PGCNF samples has negligible mesopores that can be attributed to adding GO.

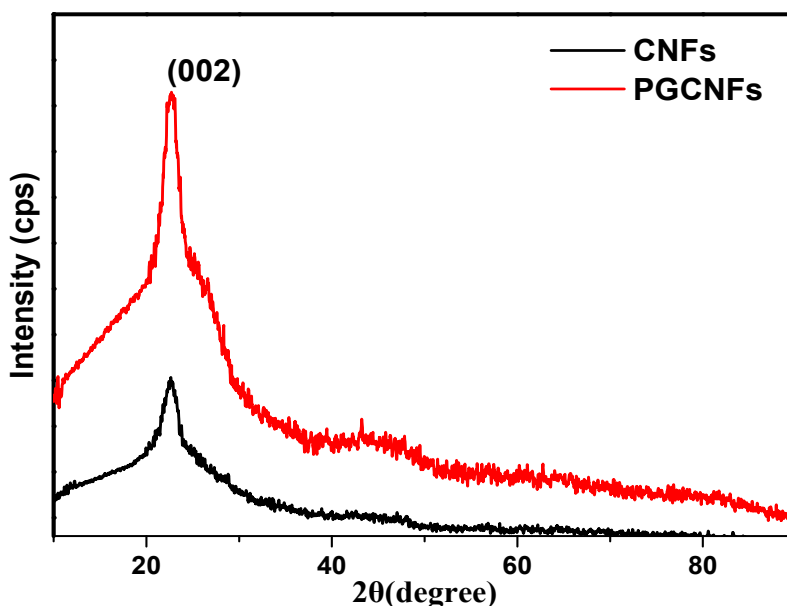


Fig S3 XRD spectrum of pure CNFs and PGCNFs

Raman information of the CNFs and PGCNFs

The peak parameters such as peak position, full width at half maximum (FWHM) and integrated intensity ratio I_D/I_G of different samples were obtained by Lorentzian fitting which were listed in Table. 1. The FWHM and the I_D/I_G ratio are 300cm^{-1} (D peak), 101cm^{-1} (G peak) and 0.9 for PGCNFs respectively, which is superior to the value of CNFs (306cm^{-1} , 112cm^{-1} and 1.2) suggesting that addition of rGO sheets can enhance the degree of graphitization to some extent.

Table S1. Peak positions, full width at half maximum (FWHM), I_D/I_G of PCNFs and PGCNFs.

sample	D peak		G peak		I_D/I_G
	Position (cm^{-1})	FWHM (cm^{-1})	Position (cm^{-1})	FWHM (cm^{-1})	
CNF	1371	306	1586	112	1.2
PGCNF	1368	300	1584	101	0.9

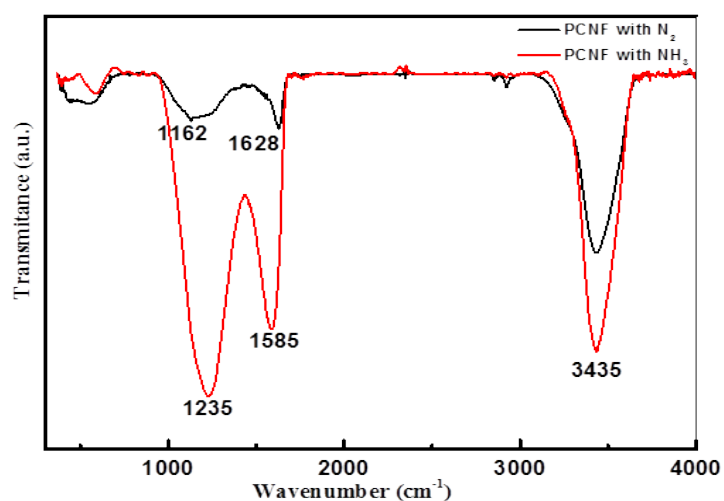


Fig S4. FT-IR spectra of the PAN-based CNFs (PCNFs) treat in N_2 at 850°C and

in NH₃ at 850°C

Fig S4 shows characteristic vibrations of PCNFs with and without NH₃ activation which exhibit the following functional groups. O-H stretching vibrations (3435 cm⁻¹), C=O stretching vibration (1628 cm⁻¹ and 1235 cm⁻¹), the peak at 1162 cm⁻¹ are partly associated with C-O stretching and O-H bending modes in the functional group, The appearance of the peak at 1580 cm⁻¹ is due to a mix of C=N, C=C and N-H groups. After activated by NH₃, the peaks at 1162 cm⁻¹ and 1628 cm⁻¹ disappeared but new absorption band emerge at 1235 cm⁻¹ and 1585 cm⁻¹ appeared. It can be ascribed to the nitrogen-containing functional groups such as -N-H.