Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Magnetism of N-Doped Graphene Nanoribbon with Zigzag Edges from Bottom-up Fabrication

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Section 1.

Synthesis of 2,3,6,7-tetraaminophenazine hydrochloride.[1]

0.107 g (0.189 mmol) of 1,2,4,5-tetraaminobenzene tetrahydrochloride, 0.215 g (2.62 mmol) of anhydrous sodium acetate and 5 mL of distilled water were added into a three-necked flask placed a reflux condense and bubbled compressed air. Then the processes were refluxed for overnight. Finally, we collected and dried to obtain the dark brownish black precipitate in quantitative yield.

Synthesis of 2,7-di-*tert*-butyl-4,5,9,10-tetraketopyrene

This process is based on the literature. [2]

Section 2. Photographic image

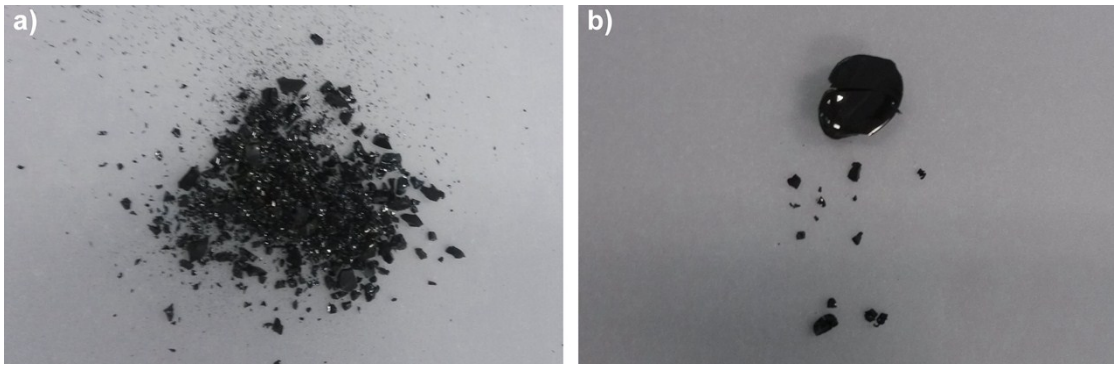

Fig. S1 Photographic images of the powder of a) TAB and b) TAP.

Section 3. Scanning Electron Microscopy

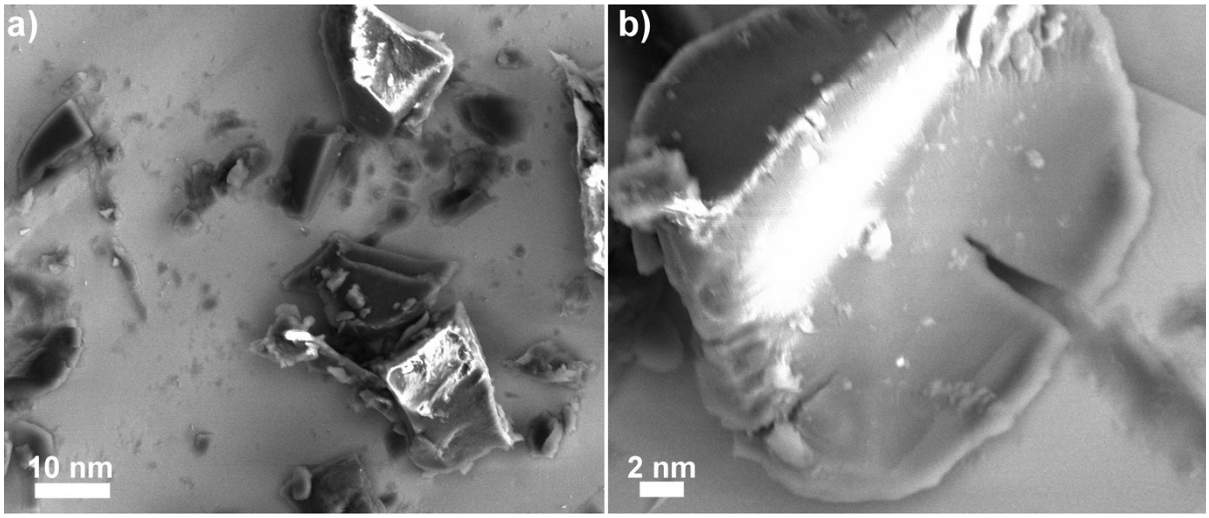

Fig. S2 SEM images of TAB sample.

The morphology and microstructures of TAB sample were further confirmed by FE-SEM. The TAB exhibited distinct 2D sheet geometry, which is similar to the graphene nanosheets.

Section 4. Atomic Force Microscopy

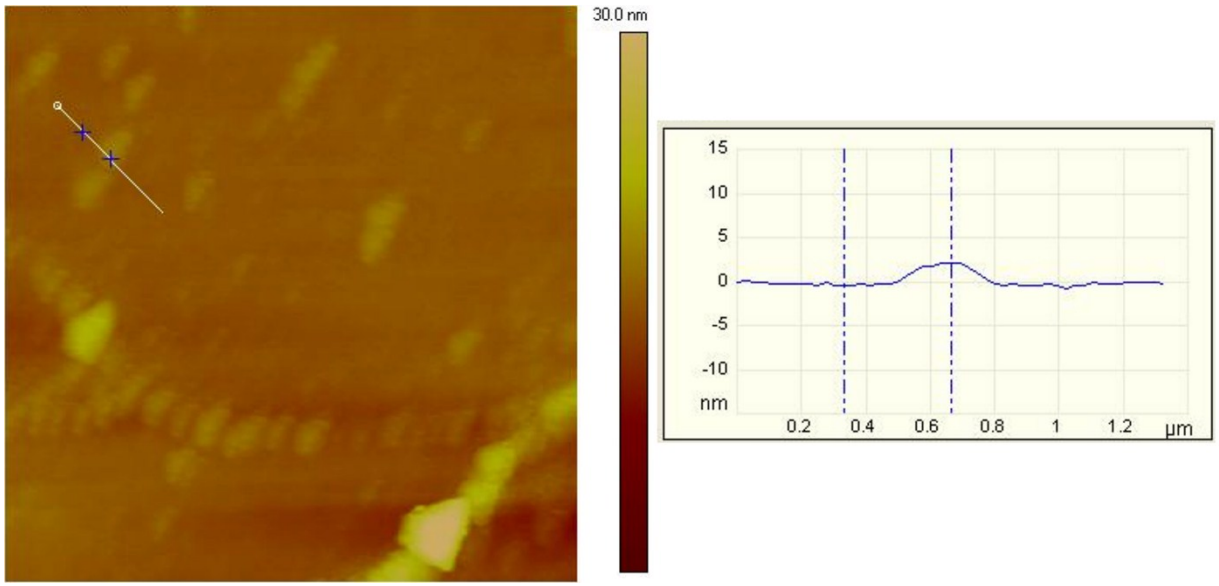

Fig. S3 Typical AFM of TAB sheets.

AFM was used to further study the materials morphology by preparing sample from severe ultrasonic dispersion in isopropanol. TABs showed typical 2D nanosheet

geometry and similar grapheme-based materials. But the TABs sheet size showed from AFM was smaller than SEM due to vigorous ultrasonic dispersion.

Section 5. Raman spectrum

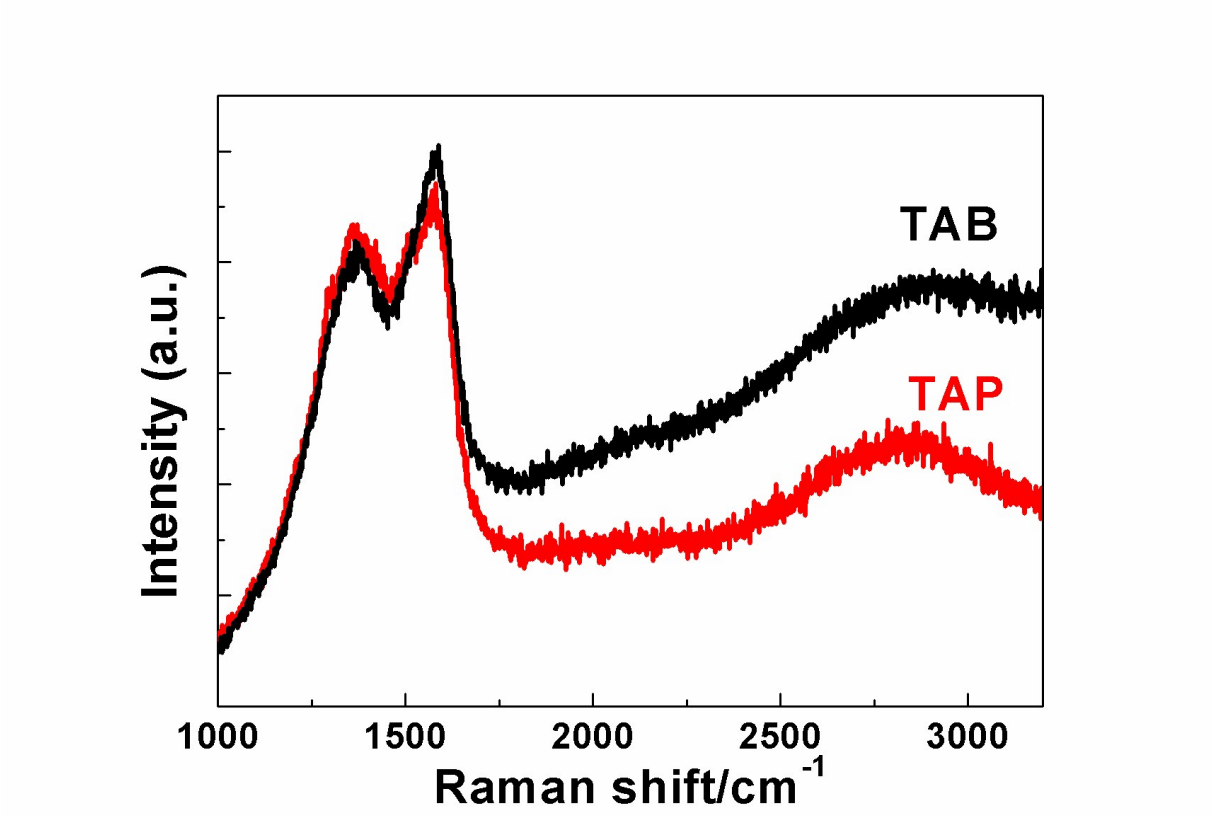

Fig. S4 Raman spectrum of TAB and TAP.

For further identifying carbon materials, Raman spectroscopy was often used to as a powerful tool. The typical Raman spectra of TABs and TAP were shown in Figure S4, which reveals the appearance of a characteristic disorder-induced peak (D peak) at 1387 cm^{-1} and G peak at 1530 cm^{-1}. Another important characteristic feature is the 2D band which revealed at round 2700 cm^{-1} and was weak, and was similar reported N-doped graphene.[3]

Section 6. Infrared spectroscopy

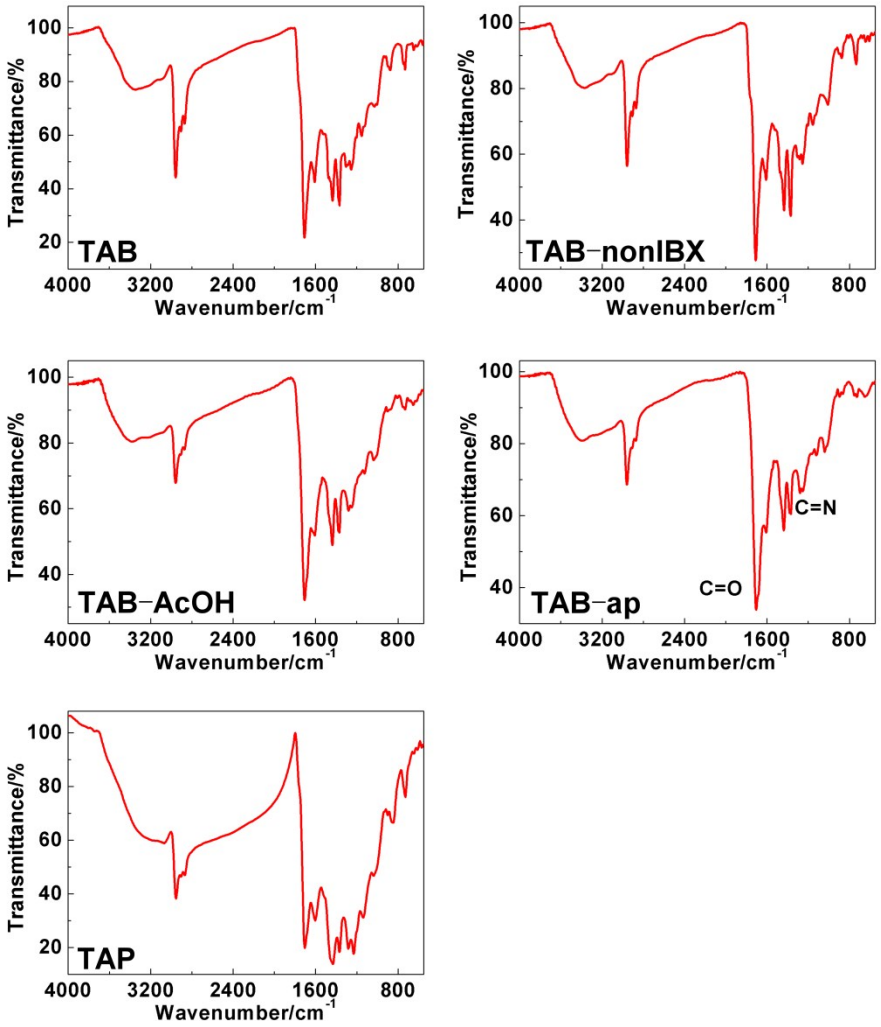

Fig. S5 Infrared spectroscopy of TAB, TAP, TAB-AcOH, TAP-nonIBX, and TAB-ap.

The peaks of 1706 cm^{-1} is due to carbonyl group which is the same to the 2,7-di-*tert*-butyl-4,5,9,10-tetraketopyrene. In Figure S4, the peaks at 1605 cm^{-1} is assigned to aromatic ring C=C stretching from phenyl rings, and ones at 1475 cm^{-1} correspond to aromatic C-C stretching from aza rings. However，the peaks respected to imine C-C=N-C stretching from aza rings is different between TAP and TAB. The peaks of TAP imine is at 1230 cm^{-1}, but TAB imine is at 1253 cm^{-1}.

Section 7. XPS Spectral Profiles

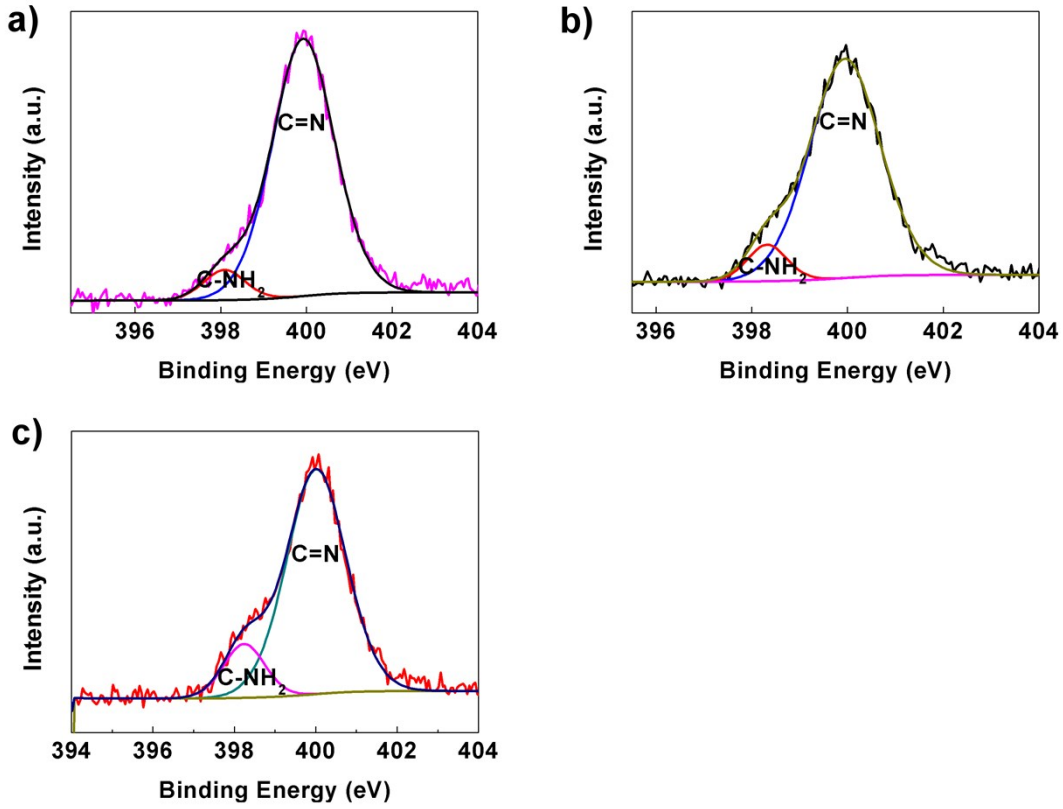

Fig. S6 N1s XPS spectra of a) TAP-nonIBX, b) TAB-AcOH, and c) TAB-ap.

Section 8. Inductively Coupled Plasma

Table S1 Trace Analysis of impurities of three samples measured by the inductively coupled plasma spectrometry. The unit is ppm. (without ruling out the impurities from plastic wrap)

Sample	Bi	Co	Cr	Fe	Hg	Mn	Pt	Ni	Cu
TAB	0	0	4.54	4.3	0	0.06	0	0	<0.01
TAB-nonIBX	0	0	5.3	3.20	0	0.81	0	2.00	6.21
TAP	0	0	5.75	3.77	0	0.85	0	0.44	6.61
TAB-AcOH	0	3.96	11.44	3.59	0	0.6	0	0	<0.01
TAB-ap	0	0	4.82	4.92	0	0.68	0	0.20	6.09

References:

1 H. M. Gajiwala, R. Zand, *Polymer,* 2000, **41**, 2009.

2 J. Hu, D. Zhang, F. W. Harris, *J. Org. Chem.,* 2005, **70**, 707.

3 Y. F. Lu, S. T. Lo, J. C. Lin, W. Zhang, J. Y. Lu, F. H.Liu, C. M. Tseng, Y. H. Lee, C. T. Liang, L. J. Li, *ACS Nano* 2013, **7**, 6522.