# Supporting information

Nitrogen doped Small Molecular Structure of Nano-graphene Observed Thier Dynamic Hierarchical Self-assemble Properties for High Performance Anodes Lithium Ion Storage

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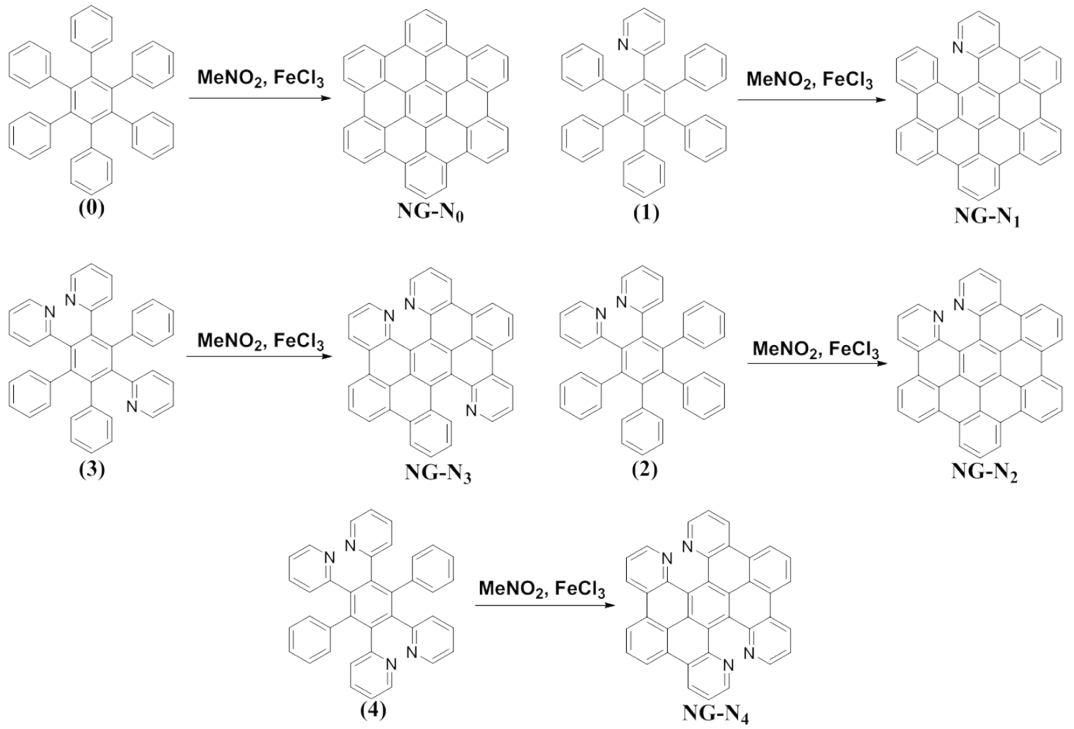
**General Information on Techniques**

Mass spectra were measured on a Waters Xevo OTof MS with an ASAP probe. Electrospray ionization (ESI) mass spectra were recorded on a Thermoquest Trace. Elemental analyses were performed using a Carlo Erba Instruments CHNS-O EA1108 analyzer.




**Scheme-1.** Routes of the N-doped NG-$N_{0\text{-}4}$ derivatives: design and synthesis.

1.1. Materials synthesis

2-(2-Phenylethynyl)pyridine [1], 2,2'-(1,2-ethynediyl)bis-pyridine [2] 2,3,4,5-tetraphenyl-2, 4-Cyclopentadien-1-one [3], 2,5-diphenyl-3,4-di-2-pyridinyl-2,4-Cyclopentadien-1-one[4], 3', 4',5',6'-tetraphenyl-1,1':2',1"-Terphenyl[5], 2-(4',5',6'-triphenyl-[1,1':2',1"-terphenyl]-3'-yl) pyridine[6], 2,2'-(3',6'-diphenyl-[1,1':2',1"-terphenyl]-4',5'-diyl)dipyridine[7], 2,2',2"-(5'-phenyl -[1,1':2',1"-terphenyl]-3',4',6'-triyl)tripyridine[6] and 2',3',5',6'-tetra(pyridin-2-yl)-1,1':4',1"-terphenyl were synthesized according to a previously reported procedure[9,10]. All other reagents were used as received from commercial sources.

1.2. General Procedure for oxidation cyclization reaction

Compound 2',3',5',6'-tetra(pyridin-2-yl)-1,1':4',1"-terphenyl (0.8g, 1.49mmol) was dissolved in dry dichloromethane (40 mL). The solution was degassed via bubbling nitrogen for 10min. Then FeCl3 (3.37g, 20mmol) in dry nitromethane (7 mL) was added slowly via a syringe. The resulting mixture was kept under nitrogen flow during the entire reaction. After 3 h, the reaction was quenched with a large volume of methanol. The dark precipitate was collected and washed with methanol / acetone / dichloromethane (1:1:1). The final brown precipitate was then collected and dried in a vacuum to afford NG-$N_4$ Yield: 0.3 g (37%). ESI–MS $(M + H)^+$:530.39 for Calculated 530.59; Found, %: C, 86.06; H, 3.45; N, 10.58. C38H18N4. Calculated, %: C, 86.02; H, 3.42; N, 10.56.

Synthesis of NG-$N_3$. A procedure analogous to the preparation of NG-$N_4$ was used and a reddish brown solid. Yield: 0.19 g (32%). ESI–MS $(M + H)^+$: 529.60 for Calculated 529.12; Found, %: C, C, 88.47; H, 3.63; N, 7.92. C39H19N3. Calculated, %: C, 88.45; H, 3.62; N, 7.93.

Synthesis of NG-$N_2$. A procedure analogous to the preparation of NG-$N_4$ was used and a yellowish-brown solid. Yield: 0.14 g (28%). ESI–MS $(M + H)^+$: 527.02 for Calculated 526.60; Found, %: C, 91.22; H, 3.42; N, 5.37. C40H18N2. Calculated, %: C, 91.23; H, 3.45; N, 5.32.

Synthesis of NG-$N_1$. A procedure analogous to the preparation of NG-$N_4$ was used and a yellowish solid. Yield: 0.15 g (34%). ESI–MS $(M + H)^+$: 525.34 for Calculated 525.61; Found, %: C, 93.68; H, 3.66; N, 2.67. C41H19N. Calculated, %: C, 93.69; H, 3.64; N, 2.66.

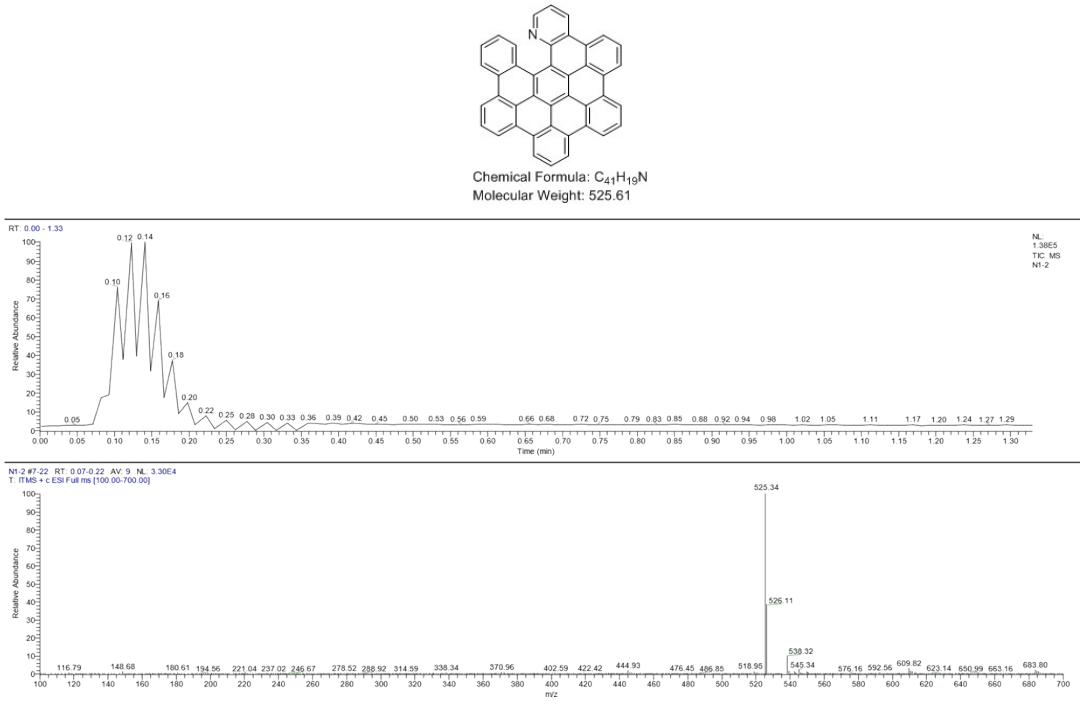



**Figure S1.** ESI-MS spectrum of **NG-N1**

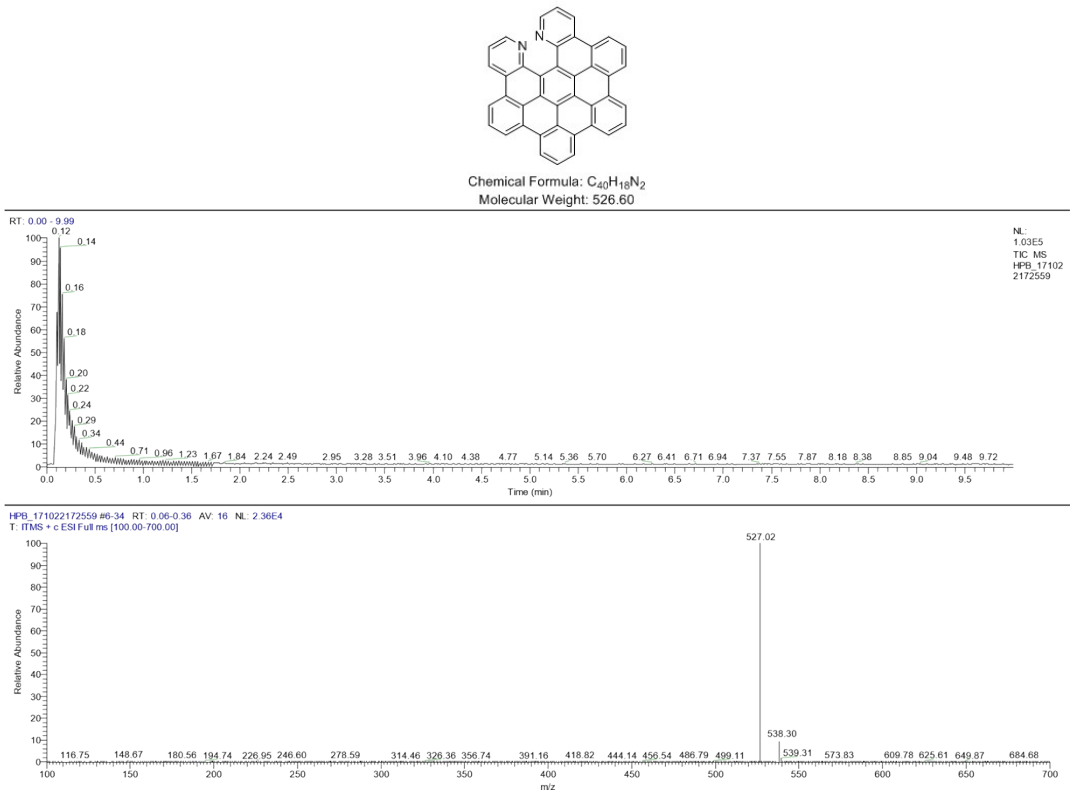



**Figure S2.** ESI-MS spectrum of **NG-N2**

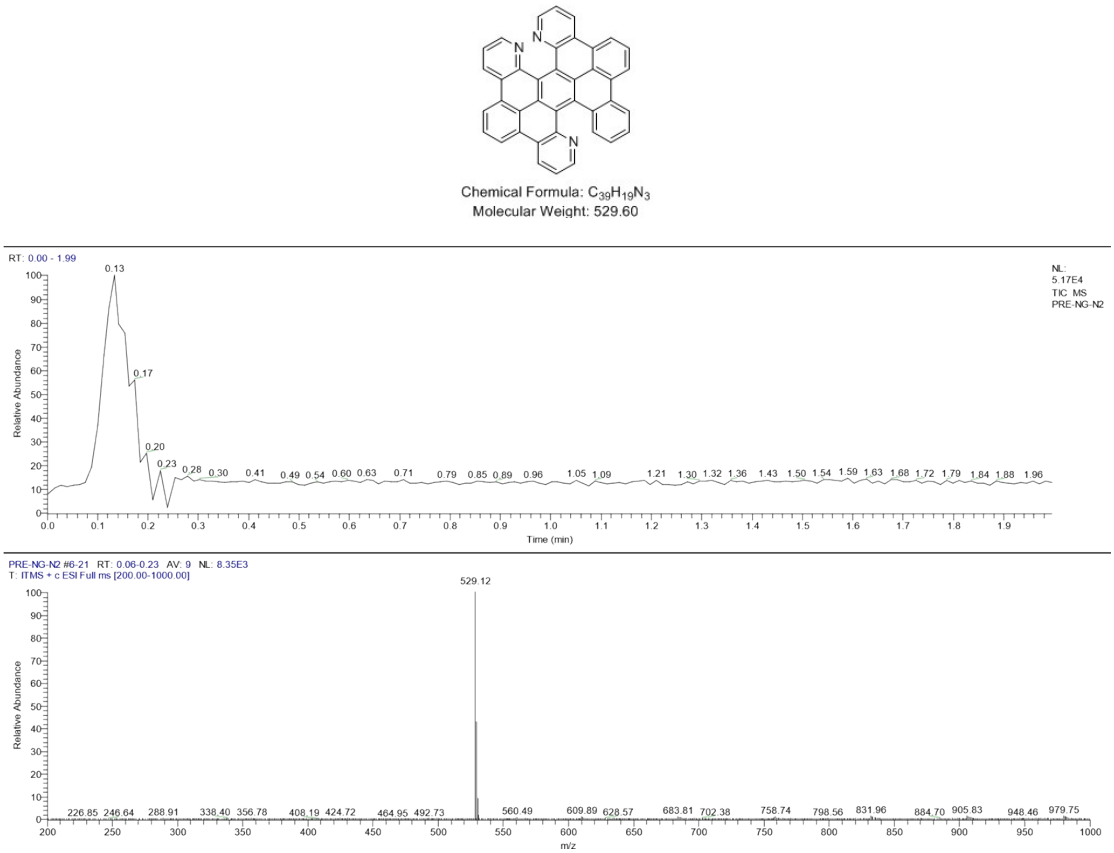



**Figure S3.** ESI-MS spectrum of **NG-N3**

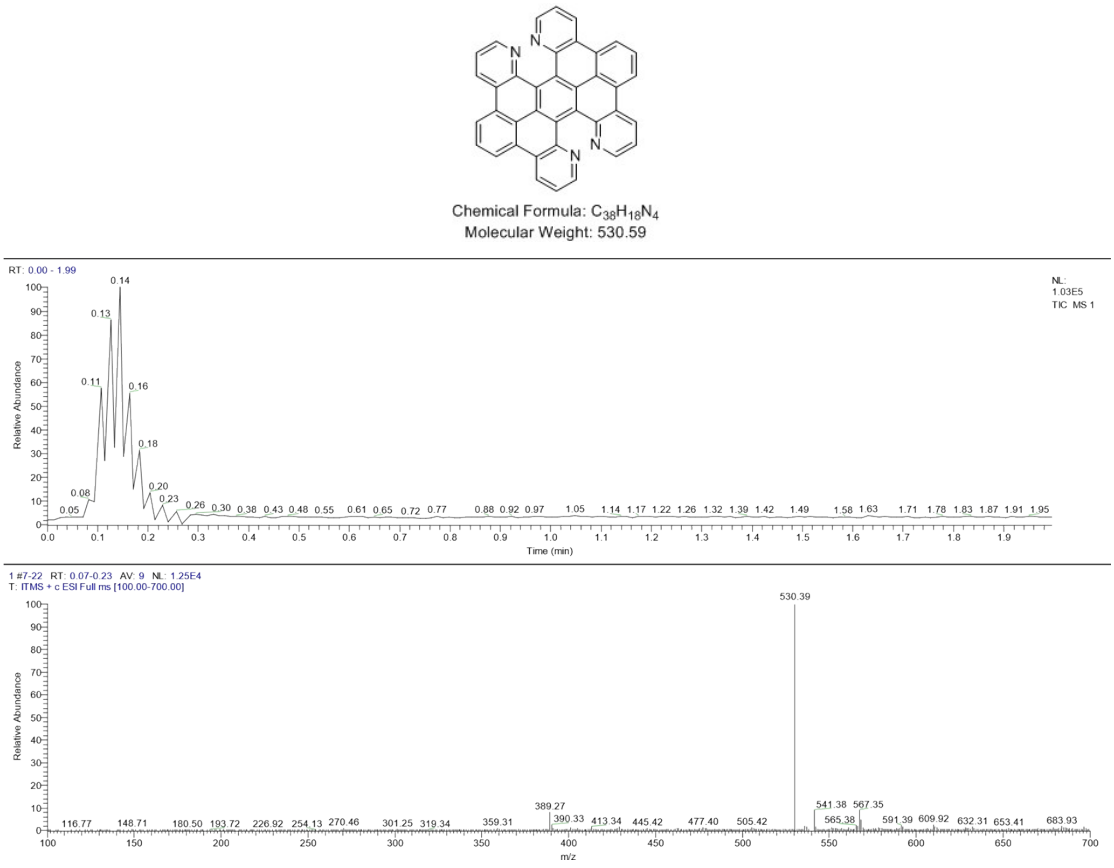



**Figure S4.** ESI-MS spectrum of **NG-N4**

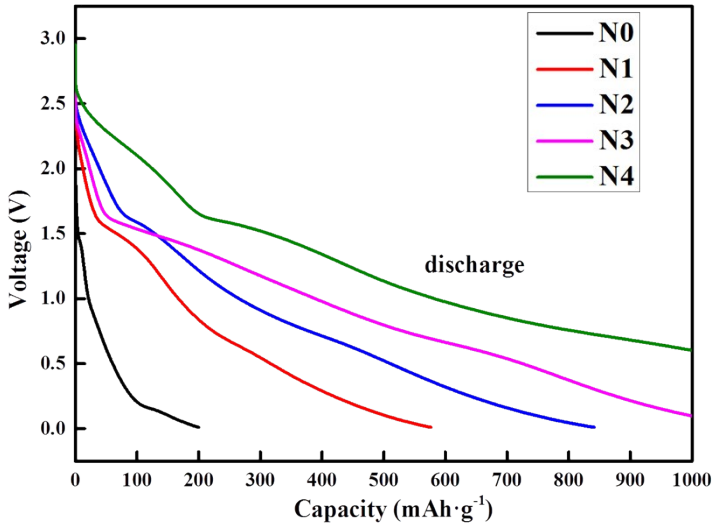



**Figure S5.** The galvanostatic discharge voltage profiles of NG-$N_{0-4}$ anode.

References

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