Supplementary information

Engineering the magnetism of nanographene via the co-deposition method

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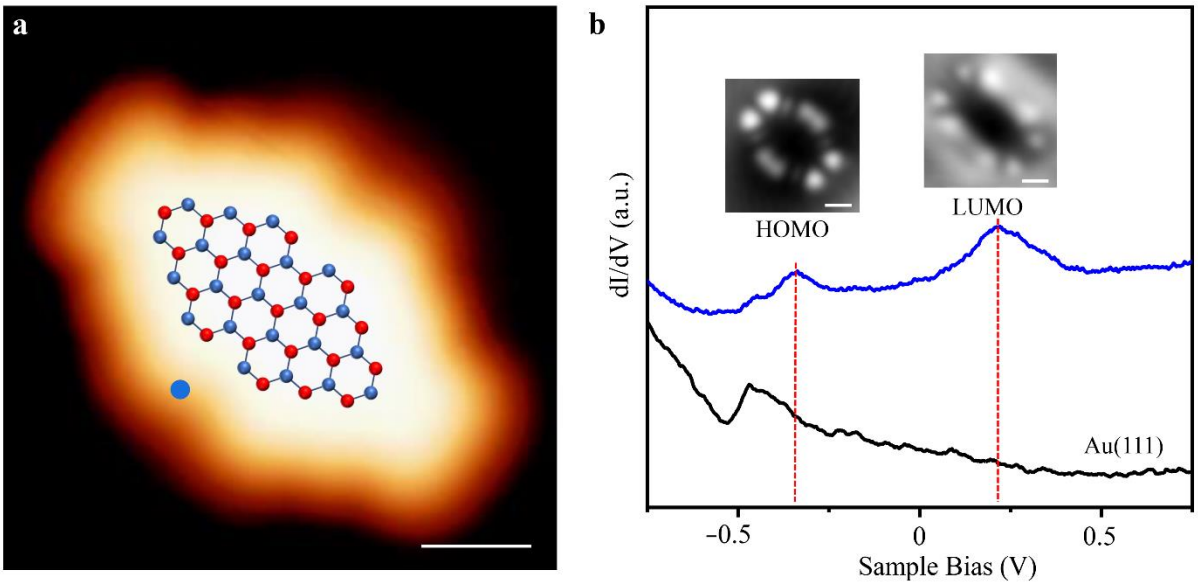
Supplementary Figures S1-S6 describing supporting scanning tunneling microscopy and spectroscopy data:

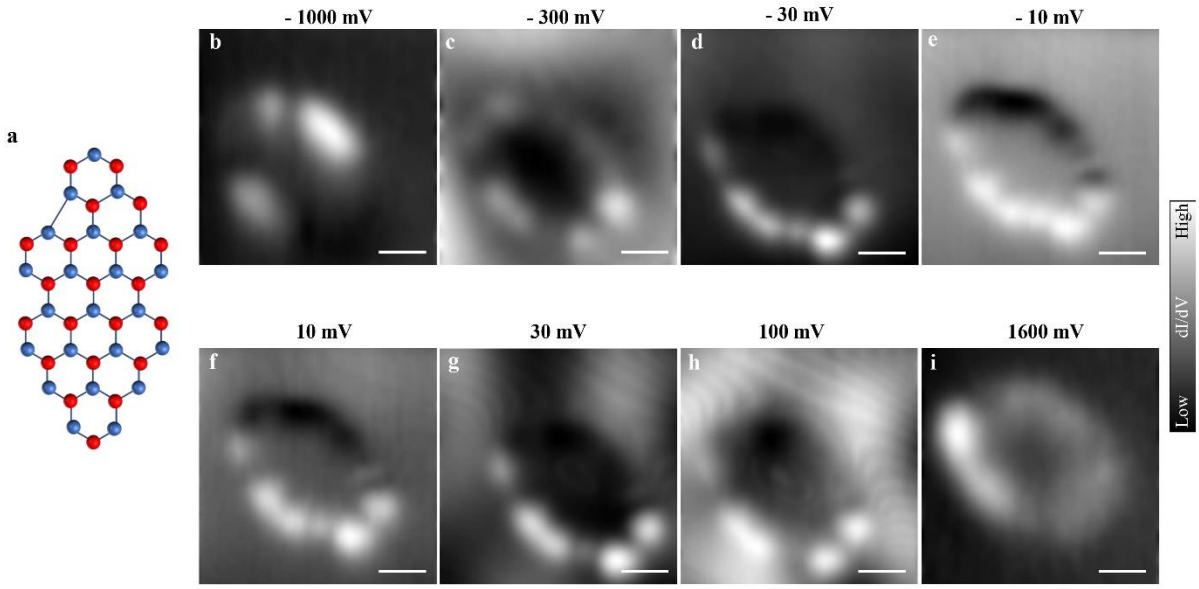
1. Characterizing the frontier molecular orbital of NG 1a
2. Additional dI/dV maps of NG 1b
3. Characterizing the Kondo resonance of NG 1b
4. Additional dI/dV maps of NG 1b
5. The radical positions of NG 2a of 6 Clar sextets
6. A comparison of BR-STM images of NG 1a and 1b

Supplementary Table S1 describing supporting comparison of close and NG 1a and altered NG 2a

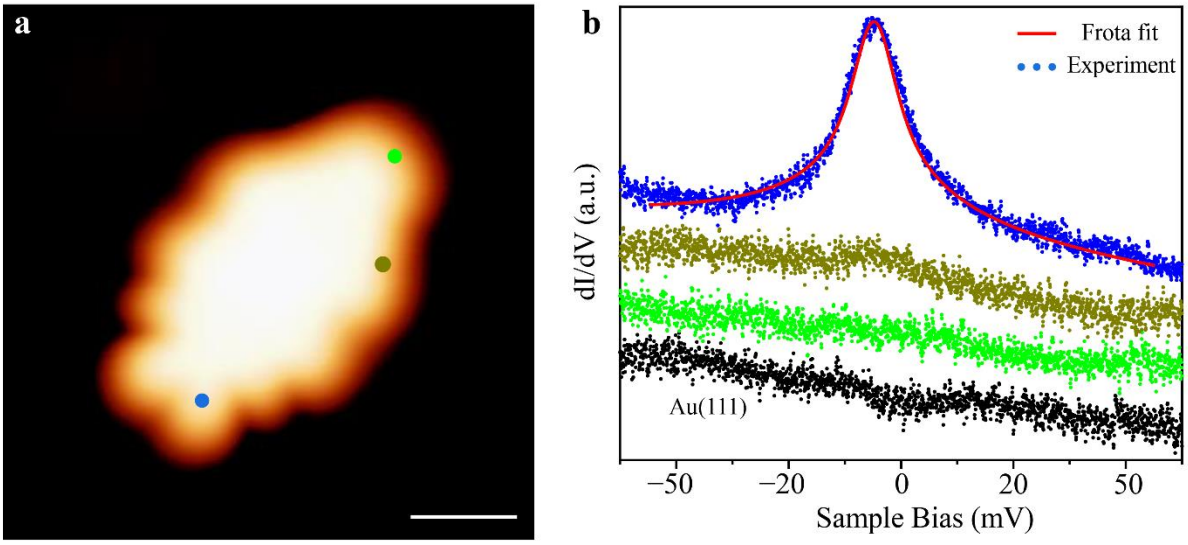
Supplementary Figures



Supplementary Figure 1 | Characterizing the frontier molecular orbital of NG 1a. (**a**) STM image and overlaid chemical structure of NG **1a**. The red and blue balls represent the carbons from two different sublattice. Tunneling parameters: $V = -500$ mV, $I = 200$ pA. Scale bar: 6 Å. (**b**) The dI/dV spectra with zoomed in energy resolution (from −0.75 V to +0.75 V) and the frontier molecular orbital of HOMO (−0.3 V) and LUMO (+0.25 V) are marked with red dotted lines. The corresponding dI/dV maps of HOMO and LUMO are attached and the node like state distribution can be recognized. Tunneling parameters: $V = -1000$ mV, $I = 300$ pA, $V_{rms} = 10$ mV.

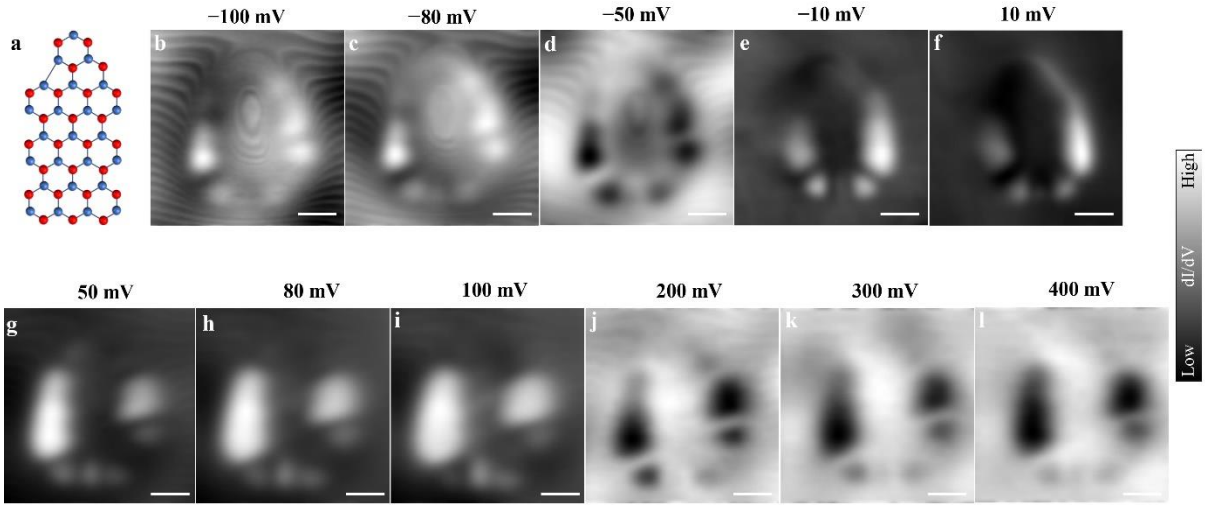


Supplementary Figure 2 | Additional dI/dV maps of NG 1b. (**a**) The chemical structure of NG **1b**. The red and blue balls represent the carbons from two different sublattice. (**b-j**) dI/dV maps of various bias voltage. The dI/dV maps under the bias voltage of −30 mV and +30 mV show the similar appearance which indicate the frontier molecular orbital of SOMO and SUMO. Tunneling parameters: I = 350 pA. Scale bar: 6 Å.

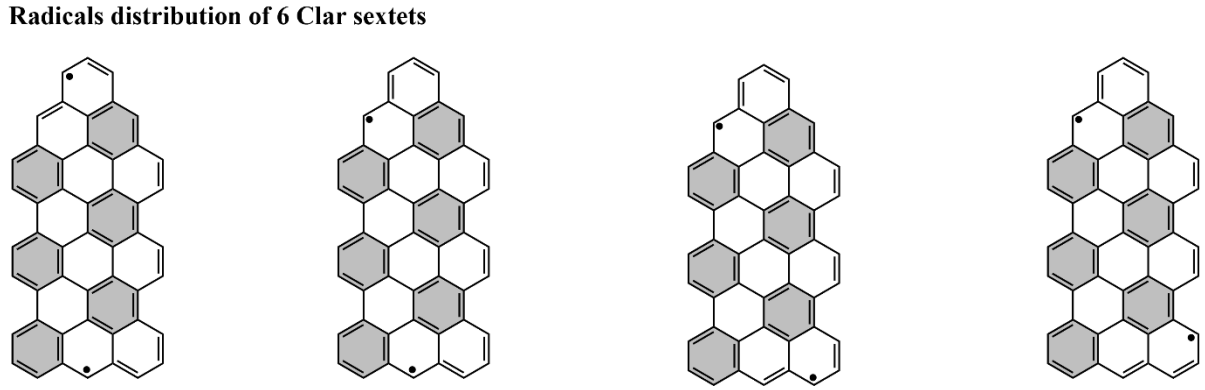


Supplementary Figure 3 | Characterizing the Kondo resonance of NG 1b. (**a**) The STM image of NG **1b**. Tunneling parameters: V = −200 mV, I = 350 pA. Scale bar: 6 pm. (**b**) Low energy range dI/dV spectra of NG **1b** and the signal acquisition position are marked in (**a**). The Kondo resonance appears when the tip position on the defect free terminus (bule circle), with

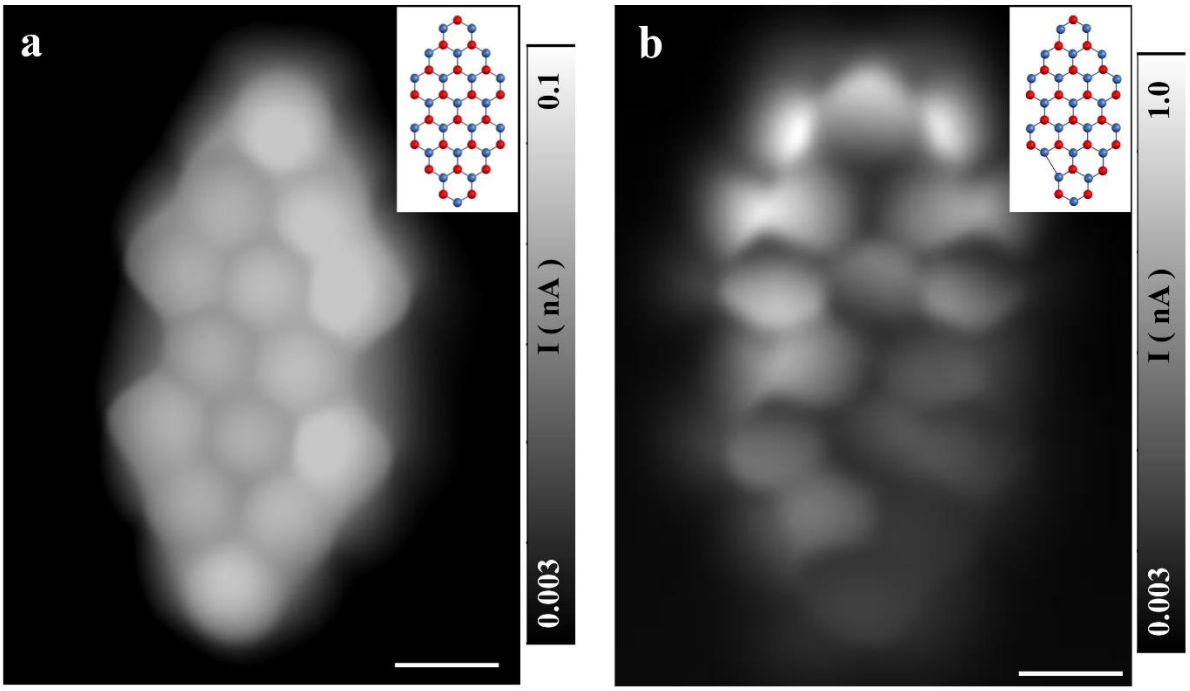
corresponding fit using the Frota function[1]. Tunneling parameters: $V = -200$ mV, $I = 350$ pA, $V_{rms} = 0.4$ mV.



Supplementary Figure 4 | Additional dI/dV maps of NG 1b. (**a**) The chemical structure of NG **1b**. The red and blue balls represent the carbons from two different sublattice. (**b-j**) dI/dV maps of a set of bias voltages. The dI/dV maps under the bias of −50 mV and +200 mV show the similar appearance which may indicate the frontier molecular orbital of SOMO and SUMO. Tunneling parameters: $I = 350$ pA. Scale bar: 6 Å.



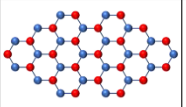
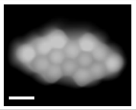
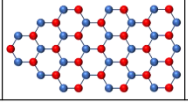
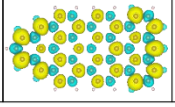
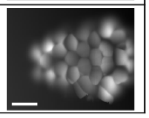
Supplementary Figure 5 | The radical positions of NG 2a of 6 Clar sextets.



Supplementary Figure 6 | A comparison of BR-STM images of NG 1a and 1b. (**a**,**b**) Constant height STM images of NG **1a** and **2a.** Constant height BR-STM in (**a**) perform as smooth feather while the enhanced states distribution at the top termini of NG **1b** which arises from Kondo resonance. Tunneling parameters: $V = +2$ mV, $z = 130$ pm (a); $V = +2$ mV, $z = 170$ pm (b). Scale bar: 3 Å.

Supplementary Table 1. **A comparison of close and NG 1a and altered NG 2a**

A summary of the comparison of NG **1a** and **2a**

	Chemical structure	The number C atoms in A sublattice (red)	The number C atoms in B sublattice (blue)	The total spin quantum number (S)	Spin order	Spin density distribution	BR-STM (scale bar: 4 pm)
NG 1a		22	22	0	-	-	
NG 2a		24	26	1	ferromagnetic		

1. Frota, H. O., Shape of the Kondo resonance. *Phys. Rev. B* **1992,** *45* (3), 1096-1099.