

Supporting Information

P-type Doping of Graphene with Cationic Nitrogen

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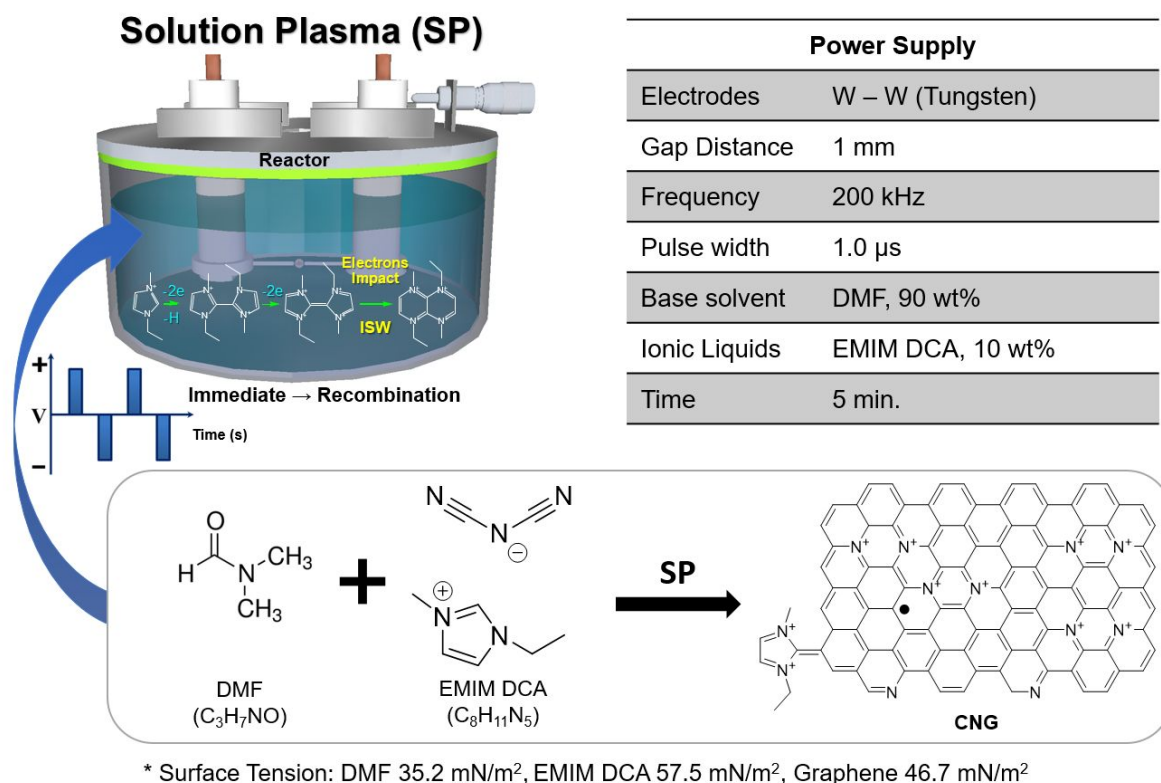


Figure S1. Schematic illustration of experimental setup for the solution plasma process. Note that the amount of ENIM DCA was limited to 10 wt% in this work owing to its high price. The increase of EMIM DCA amount may lead to change in properties of CNG, such as crystal structure, cationic N doping level, and N bonding configuration, which is still under progress and investigation.

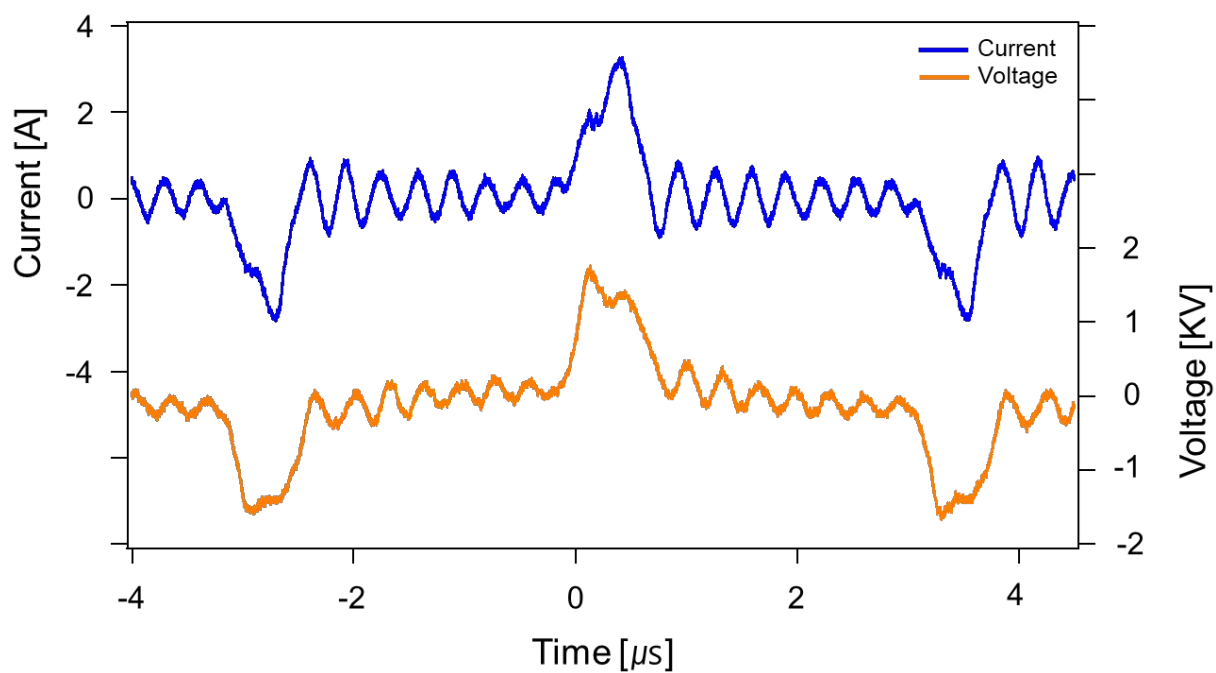


Figure S2. Typical current and voltage waveforms of plasma during the synthesis of CNG.

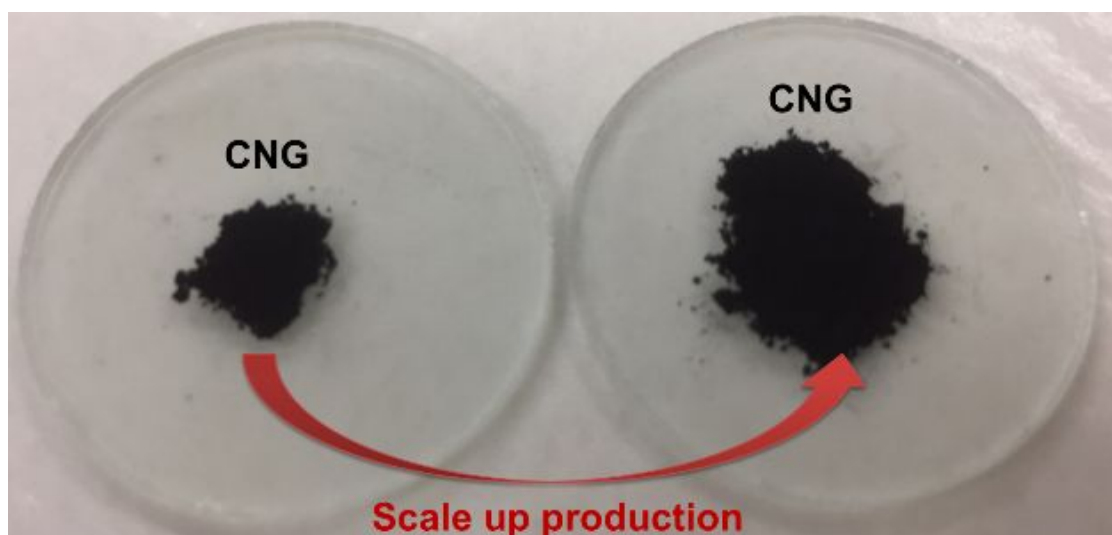


Figure S3. Photograph of CNG with scale-up production.

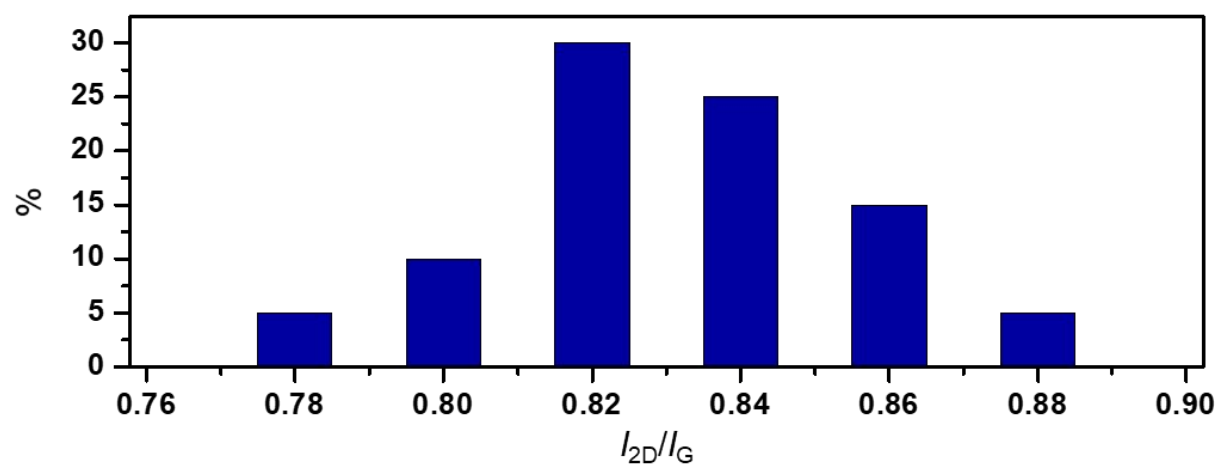


Figure S4. Statistical analysis of the Raman spectra of I_{2D}/I_G of the CNG obtained from 30 random spots.

Table S1. N-doped methods and nitrogen concentration on carbon

Materials	Elemental composition (at%)			Method	Ref.
	C	O	N		
CNG	81.4	5.2	13.4	SP	Present work
N-doped carbon sheet	-	-	3.1	SP	S1
N-doped graphene oxide	-	-	6.7	Hydrothermal	S2
N-doped graphene sheet	-	-	3.0-5.0	Thermal treatment	S3
N-doped CNFs	-	-	5.4	Electrospinning	S4
N-doped graphene	-	-	4.0	CVD	S5
N-doped graphene	-	-	1.0	N ₂ H ₄ treatment	S6

Table S2. Electrical conductivity of CNG by SP compared to other carbon materials in literature.

Materials	Type	Doping	Surface resistance [Ω sq ⁻¹]	Hall mobility [cm ² V ⁻¹ s ⁻¹]	Carrier concentration [cm ⁻³]	Ref.
CNG	P	N	16.0	3.4	1.00E+19	Present work
PECVD	P	Au	-	25	7.00E+17	S7
P-doped graphene by MBE	P	P	-	25	1.40E+17	S8
Graphene-GaN	P	-	-	2.4	8.00E+17	S9
Graphene-Zinc Phosphide	P	-	-	-	6.00E+16	S10
Graphite	Pristine	-	-	-	5.00E+18	S11

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