

Supporting Information

Li-air battery and ORR activity of nanocarbons produced on synthesis rate by solution plasma process

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Benzene conversion pathway is polymerization by SPP

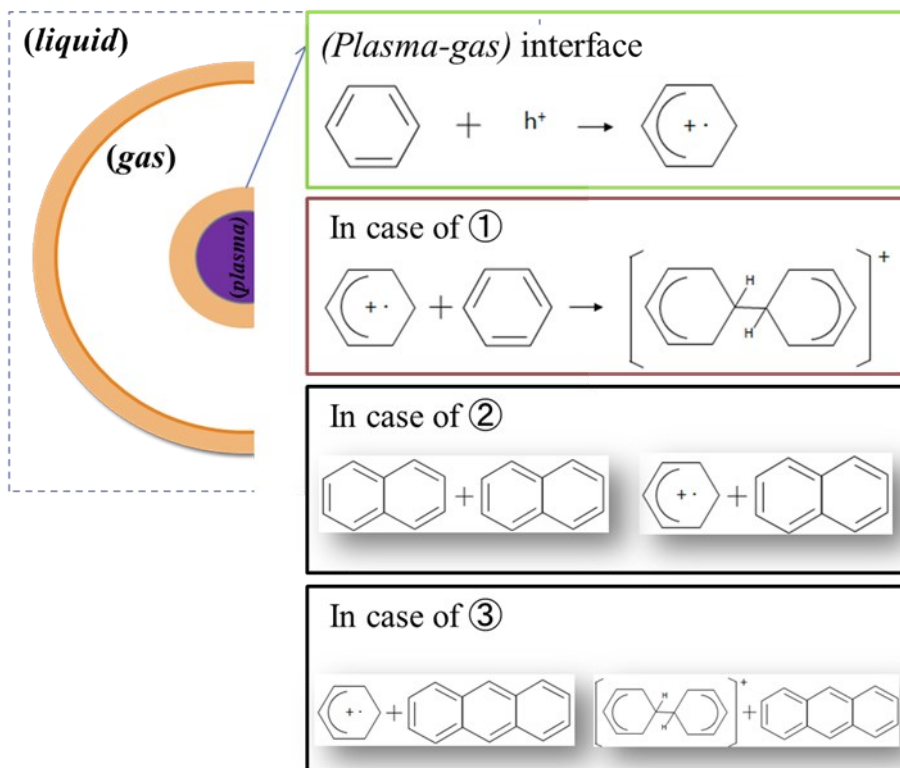


Fig. S1. Schematic of nanocarbon formation from BZ using SPP.

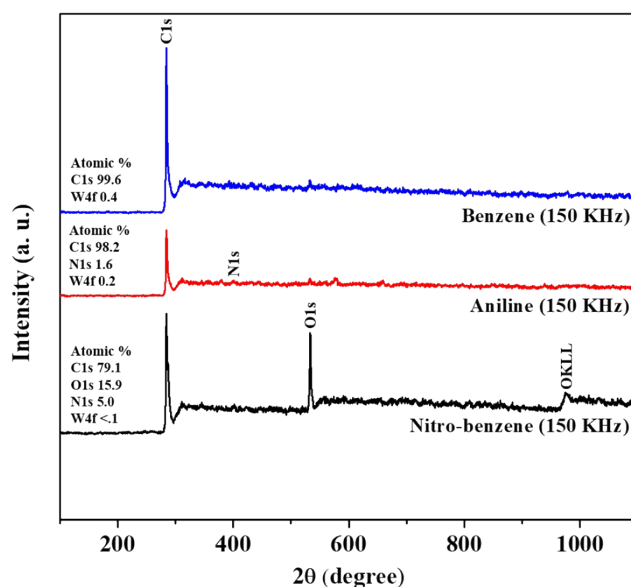


Fig. S2 XPS elemental compositions (% atom) of nanocarbons of BZ, BZ-NH₂ and BZ-NO₂

Table S1. The carbon yield (%) and synthesis rate are calculated from the carbon powder

Conditions	Carbon Powder, M (mg)	Synthesis rate, R (mg/min)	Carbon yield, Y (%)
BZ (50 KHz, 0.5 μs)	1260	42	1.61
BZ (150 KHz, 0.5 μs)	1500	50	1.92
BZ-NO ₂ (50 KHz, 0.5 μs)	180	6	0.15
BZ-NO ₂ (150 KHz, 0.5 μs)	390	13	0.32
BZ-NH ₂ (50 KHz, 0.5 μs)	210	7	0.23
BZ-NH ₂ (50 KHz, 0.5 μs)	450	15	0.48

Table S2. SPP conditions for the conversion of palm oil to nanocarbon composite for 1 μ s and 40 min discharge.

Frequency (kHz)	Surface area (m ² /g)	Pore volume (cm ³ /g)	Average pore diameter (nm)
BZ	220	0.45	20.0
BZ-NH ₂	230	0.49	17.0
BZ-NO ₂	222	0.46	15.0

Table S3. The resistance (Ω), surface resistance (Ω/cm^2), resistivity ($\Omega.\text{cm}$) and electrical conductivity (s/cm) tested by four-point probe in the different conditions for benzene.

Conditions	Film thickness (μm)	Resistance (Ω)	Surface resistance (Ω/cm^2)	Electrical conductivity (s/cm)	Resistivity ($\Omega.\text{cm}$)
Benzene (150 kHz, 0.5 μ s)	88	6.98×10^3	3.16×10^4	3.59×10^{-3}	278.4
Benzene (100 kHz, 0.5 μ s)	112	7.89×10^3	3.57×10^4	2.53×10^{-3}	395.9
Benzene (50 kHz, 0.5 μ s)	95	9.88×10^3	4.48×10^4	2.48×10^{-3}	403.0

Table S4. The resistance (Ω), surface resistance (Ω/cm^2), resistivity ($\Omega.\text{cm}$) and electrical conductivity (s/cm) tested by four-point probe in the different conditions for Aniline.

Conditions	Film thickness (μm)	Resistance (Ω)	Surface resistance (Ω/cm^2)	Electrical conductivity (s/cm)	Resistivity ($\Omega.\text{cm}$)
Aniline (150 kHz, 0.5 μs)	70	5.29×10^4	2.40×10^5	6.61×10^{-4}	1513
Aniline (100 kHz, 0.5 μs)	76	6.06×10^4	2.75×10^5	5.78×10^{-4}	1729
Aniline (50 kHz, 0.5 μs)	63	8.31×10^4	3.77×10^5	4.22×10^{-4}	2373

Table S5. The resistance (Ω), surface resistance (Ω/cm^2), resistivity ($\Omega.\text{cm}$) and electrical conductivity (s/cm) tested by four-point probe in the different conditions for Nitro-benzene.

Conditions	Film thickness (μm)	Resistance (Ω)	Surface resistance (Ω/cm^2)	Electrical conductivity (s/cm)	Resistivity ($\Omega.\text{cm}$)
Nitro-Benzene (150 kHz, 0.5 μs)	181	9.30×10^3	4.22×10^4	2.14×10^{-3}	467.8
Nitro-Benzene (100 kHz, 0.5 μs)	170	7.05×10^3	3.19×10^4	1.72×10^{-3}	577.4
Nitro-Benzene (50 kHz, 0.5 μs)	164	7.70×10^3	3.17×10^4	1.73×10^{-3}	581.4

