

Supplementary Materials

Ultrafast Room Temperature Synthesis of Porous Polythiophene via Atmospheric Pressure Plasma Polymerization Technique and Its Application to NO₂ Gas Sensors

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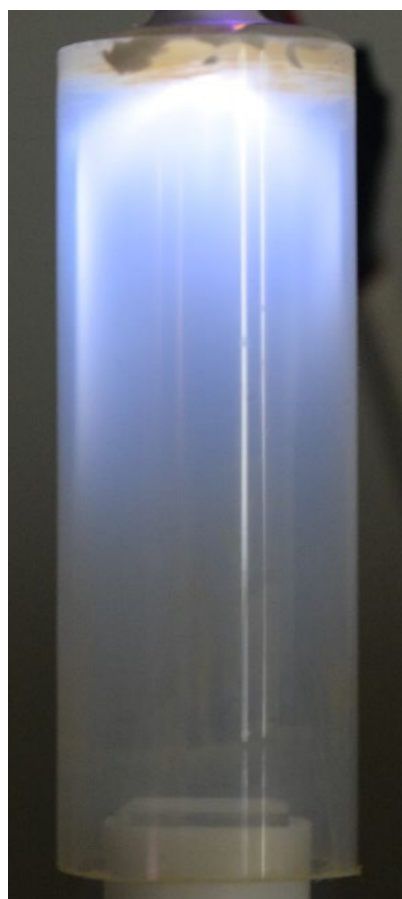


Figure S1. A photograph of the plasma produced with supply of vaporized thiophene monomer.

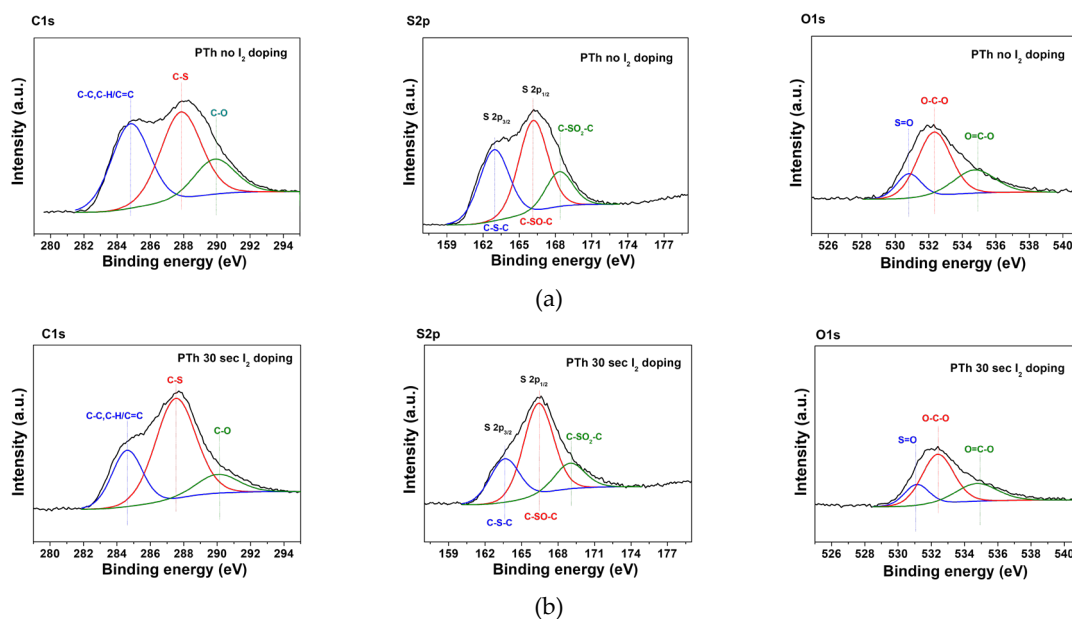
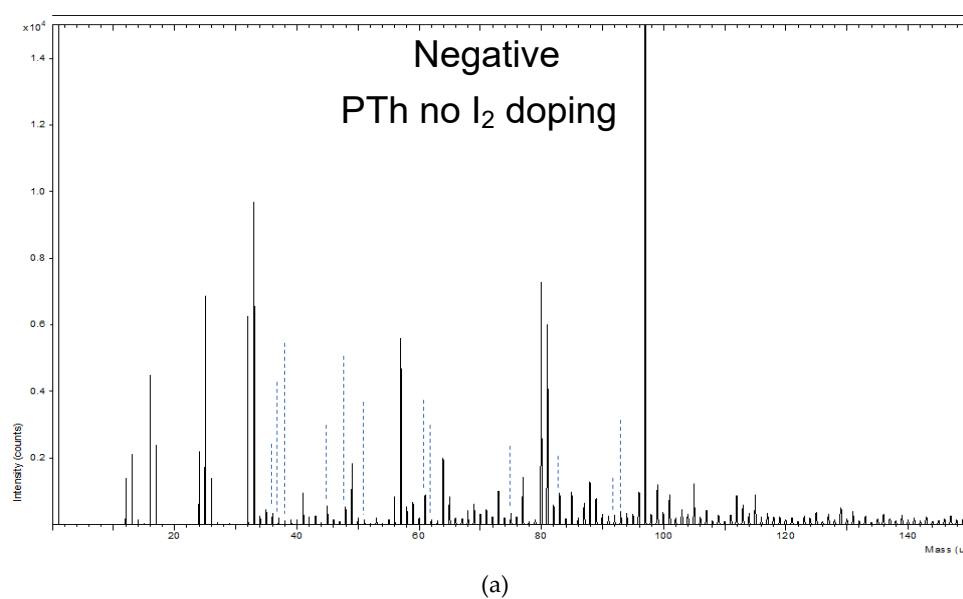
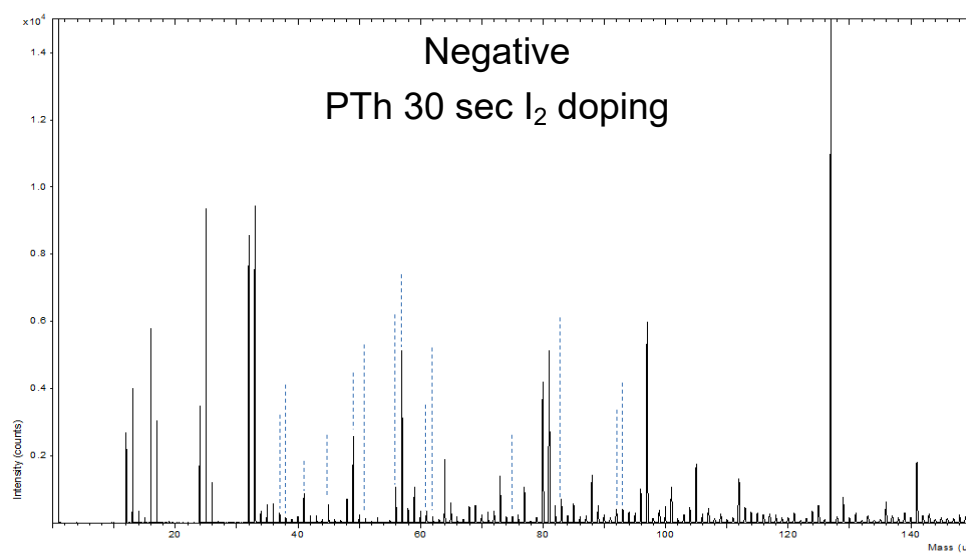
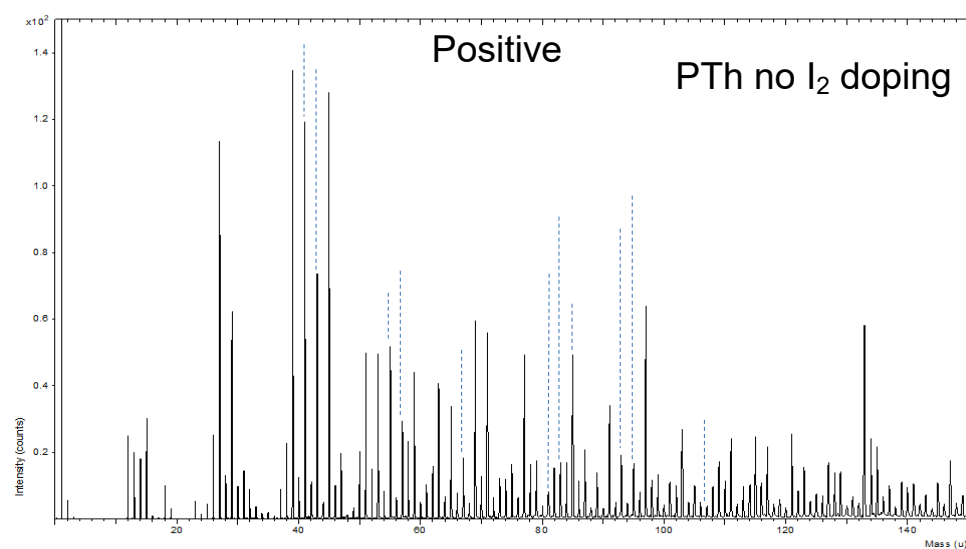


Figure S2. The detailed high-resolution with deconvolutions of C 1s, S 2p, and O 1s spectra in Figure 3 of the plasma polymerized thiophene films (a) without and (b) I₂ doping.

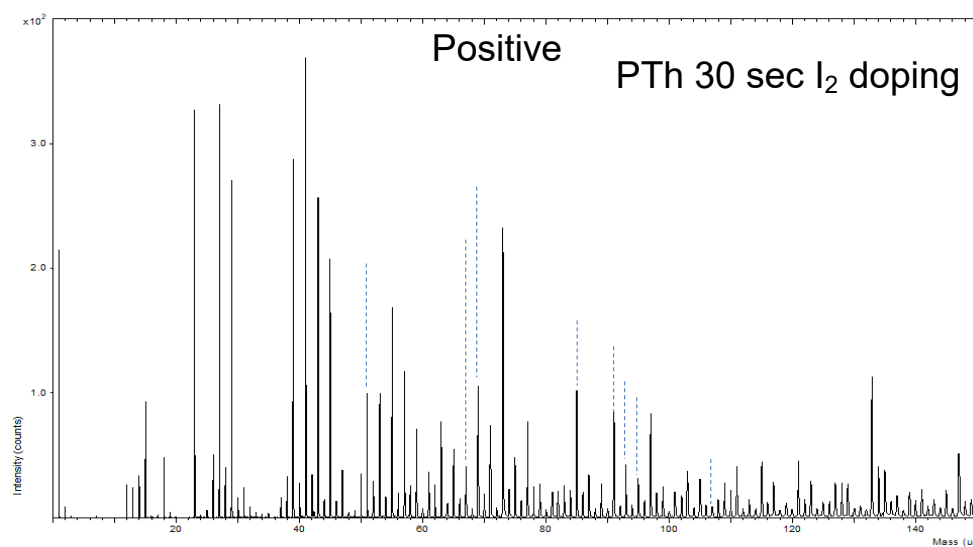




(b)



(c)



(d)

Figure S3. Negative-ion spectra (0-150 amu) and positive-ion spectra (0-150 amu) of ToF-SIMS on surface of the plasma polymerized thiophene films without and with I₂ doping. (a) Negative-ion without I₂ doping. (b) Negative-ion with I₂ doping. (c) Positive-ion without I₂ doping. (d) Positive-ion with I₂ doping.

Table S1. Selected peaks and their assignments observed in negative-ion time of flight secondary ion mass spectrometry (ToF-SIMS) spectra of the PTh films.

Negative ion mass spectrum	Possible ion fragment/Possible structure
<i>m/z</i>	
1	H ⁻
12	C ⁻
13	CH ⁻
15	NH ⁻
16	O ⁻
17	OH ⁻
24	C ₂ ⁻
25	C ₂ H ⁻
32	S ⁻
33	HS ⁻
36	C ₃ ⁻
37	C ₃ H ⁻
38	C ₃ H ₂ ⁻
41	C ₂ HO ⁻
44	CS ⁻
45	CHO ₂ ⁻ , CHS ⁻
48	C ₄ ⁻ , SO ⁻
49	C ₄ H ⁻
51	C ₄ H ₃ ⁻
56	C ₂ S ⁻
57	C ₂ HS ⁻
61	C ₅ H ⁻
62	C ₅ H ₂ ⁻
64	SO ₂ ⁻

73	C ₆ H ⁺
75	C ₆ H ₃ ⁺
80	SO ₃ ⁺
81	C ₄ HS ⁺
83	C ₄ H ₃ S ⁺
92	C ₅ S ⁺
93	C ₅ HS ⁺
97	C ₈ H ⁺
105	C ₆ HS ⁺
129	C ₈ HS ⁺

Table S2. Selected peaks and their assignments observed in positive-ion ToF-SIMS spectra of the PTh films.

Positive ion mass spectrum	Possible ion fragment/Possible structure
<i>m/z</i>	
1	H ⁺
12	C ⁺
15	CH ₃ ⁺
27	C ₂ H ₃ ⁺
29	C ₂ H ₅ ⁺
39	C ₃ H ₃ ⁺
41	C ₃ H ₅ ⁺
43	C ₃ H ₇ ⁺
51	C ₄ H ₃ ⁺
55	C ₄ H ₇ ⁺
57	C ₄ H ₉ ⁺
67	C ₅ H ₇ ⁺
69	C ₅ H ₉ ⁺
77	C ₆ H ₅ ⁺
81	C ₆ H ₉ ⁺
83	C ₅ H ₇ O ⁺
85	C ₄ H ₅ O ₂ ⁺
91	C ₇ H ₇ ⁺

93	$C_7H_9^+$
95	$C_7H_{11}^+$
107	$C_7H_7O^+$

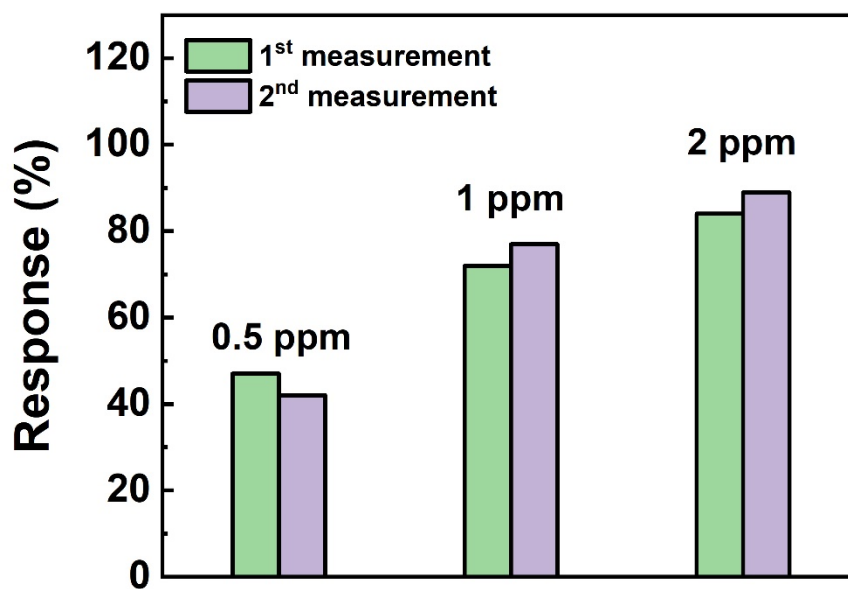


Figure S4. Repeatability of the sensors based on I₂-doped PTh films at different NO₂ concentrations.