

Supporting information

Hydrogen Sensing at Room Temperature Using Flame-synthesized Palladium-decorated Crumpled Reduced Graphene Oxide Nanocomposites

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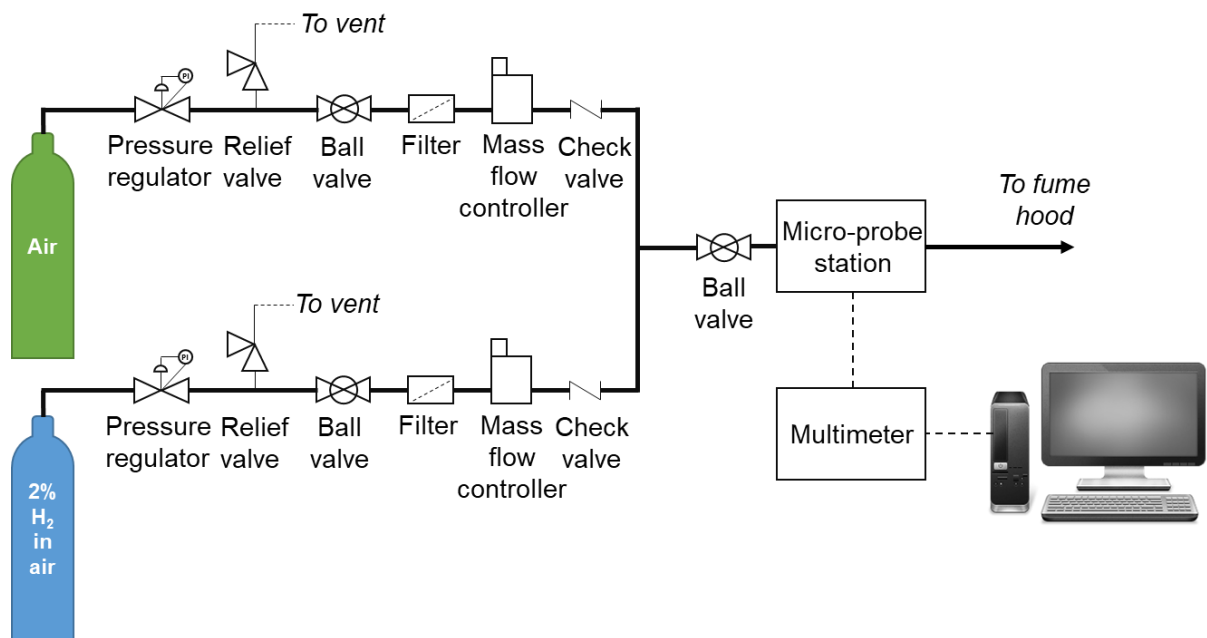


Figure S1. Schematic of the sensor testing apparatus.

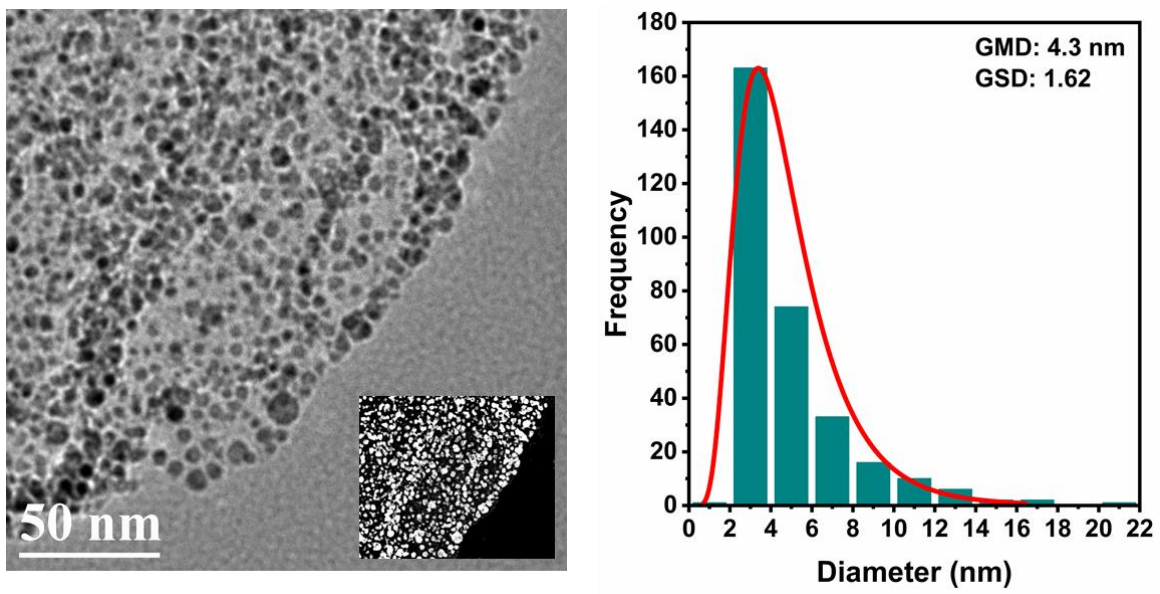


Figure S2. TEM image and the corresponding particle size distribution for Pd-CGB.

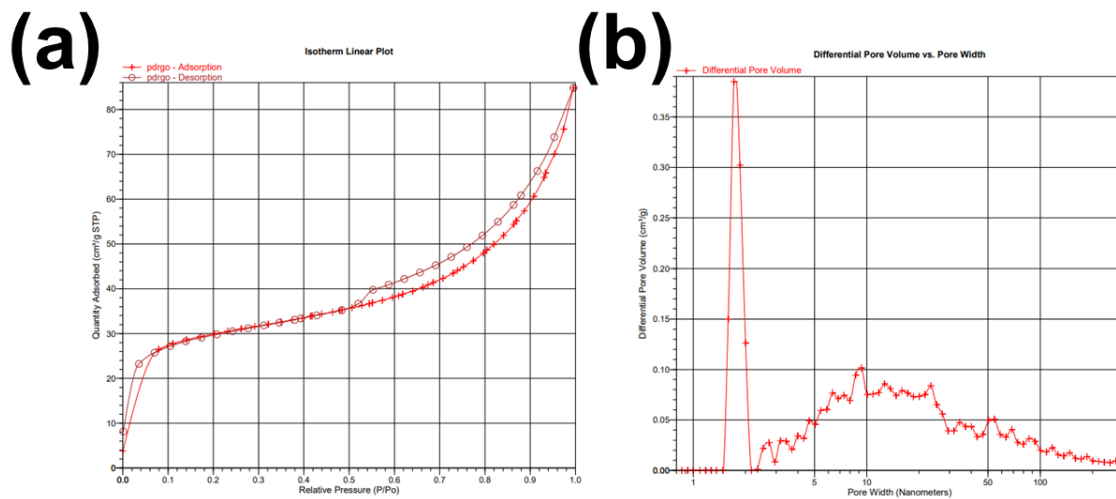


Figure S3. a) Nitrogen physisorption isotherm used for BET surface area analysis of Pd-CGB; b) differential pore volume versus pore width of Pd-CGB based on the BJH analysis.

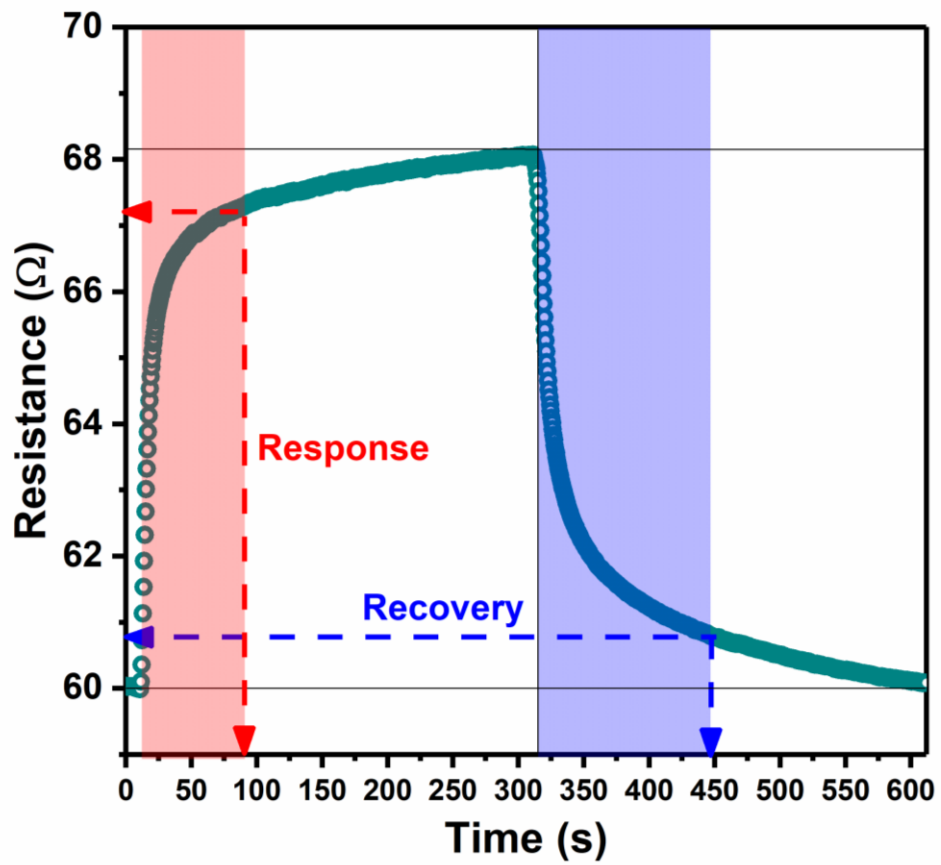


Figure S4. Detailed response and recovery time extraction based on 90% change in resistance for 2% H₂ response.

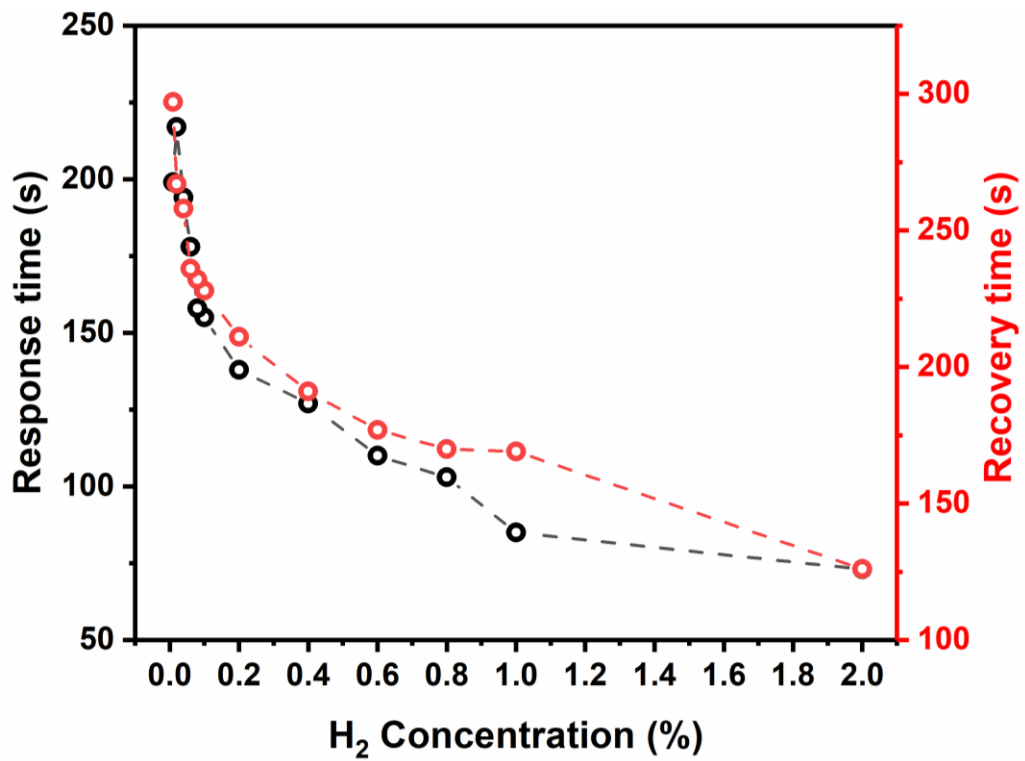


Figure S5. Response and recovery times for various H₂ concentrations from 0.01 to 2%.

Table S1. Pd-graphene chemo-resistive sensors for H₂ detection in air at room temperature

No.	Sensing material	Synthesis method	Response value	Response time	Recovery time	Sensing range (%)	LOD (ppm)	Year	Ref.
1	Pd-CGB	Reduction of Pd and GO using Flame	14.8% at 2%	73 s	126 s	0.0025 – 2	25	2020	This report
2	Pd NP/G	Chemical decoration - CVD	5.9% at 1%	180 s	540 s	1 – 4	10000	2019	[1]
3	3D porous laser-induced graphene (LIG) decorated with Pd	e-beam evaporation - Laser on polyimide	3.3% at 1%	NA	NA	0.06 - 1.3	600	2019	[2]
4	Pd-functionalized, suspended graphene	e-beam deposition - CVD	1.5% at 0.01%	42 s ¹	NA	0.001 - 0.01	10	2018	[3]
5	Pd NP/G	Chemical reduction of Pd - Liquid Phase Exfoliation of graphite	26% at 1%	40 s ²	490 s ³	1	10000	2017	[4]
6	Pt-Pd/rGO	Chemical reduction of Pd and GO	52% at 0.8%	~720 s	~600 s	0.005 - 0.8	50	2016	[5]
7	Nanoporous Pd-rGO	Chemical reduction of Pd and GO	30.6% at 1%	360 s	120 s	0.00001 – 1	1	2015	[6]
8	Pd NP/rGO	Microwave - CVD	14.7% at 1%	~30 s	450 s	0.01 – 5	100	2015	[7]
9	Pd NP/G	Thermal evaporation - CVD	6.7% at 0.0015%	~59 s ⁴	~400 s	0.0002 - 0.0015	2	2015	[8]
10	Pt/Pd core-shell-G	Chemical reduction of Pd, Pt and GO	36% at 1%	180 s	72 s	0.00001 – 4	1	2015	[9]
11	Pd Nanocube-rGO	Chemical reduction of Pd and GO	11% at 0.1%	1080 s	2400 s	0.0006 - 0.1	6	2014	[10]
12	NiPd-rGO	Chemical reduction of Pd, Ni and GO	11% at 0.1%	180 s	7200 s	0.00001 – 1	1	2014	[11]
13	Pd Nanocube-rGO	Chemical reduction of Pd and GO	17.7% at 1%	450 s	660 s	0.001 – 1	10	2014	[12]

14	palladium-decorated graphene nanoribbon film/SiO ₂ /Si	Chemical reduction of Pd and GO ribbons	2000% at 1%	625 s	NA	0.01 – 1	100	2014	[13]
15	Pd film/exfoliated G	Magnetron sputtering - exfoliation	4.5% at 1%	8 s ⁴	210 s	0.005 – 2	50	2013	[14]
16	Pd NP/G	e-beam evaporation - CVD	4.1% at 0.05%	213 s	463 s	0.0025 – 1	25	2010	[15]

¹ defined as the time to reach half of the value

² defined as the time between 10% to 90% of the response

³ defined as the time between 90% to 10 of the recovery

⁴ defined as the time to reach ($e^{-1}=36.8\%$)

References

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