

Supporting Information

Quantitative analysis of the synergistic effect of Au nanoparticles on SnO₂- Quantitative analysis of the synergistic effect of Au nanoparticles on SnO₂-rGO nanocomposites for room temperature hydrogen sensing

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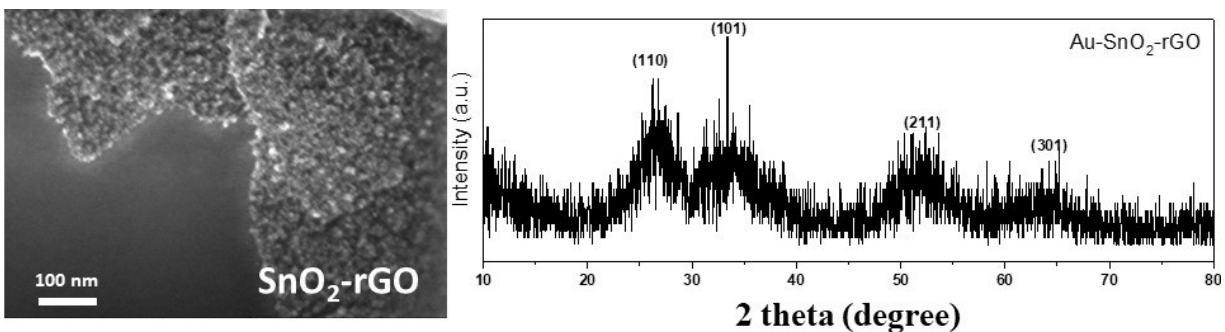


Figure S1. SEM image of SnO₂-rGO and XRD pattern of Au-SnO₂-rGO.

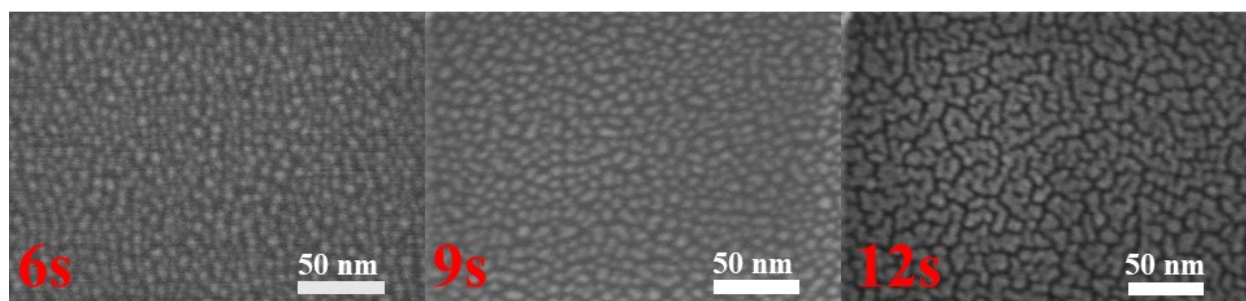


Figure S2. SEM images of sputtered gold nanoparticles on the silicon wafer with different sputtering time.

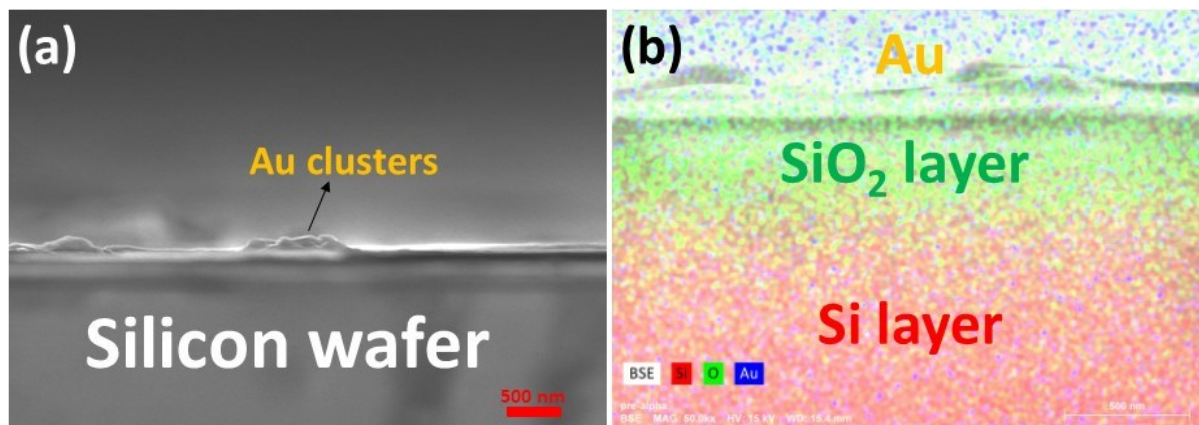


Figure S3. a) SEM side view image of the sensor chip with sputtered gold, b) EDX mapping results of the prepared sensor chip.

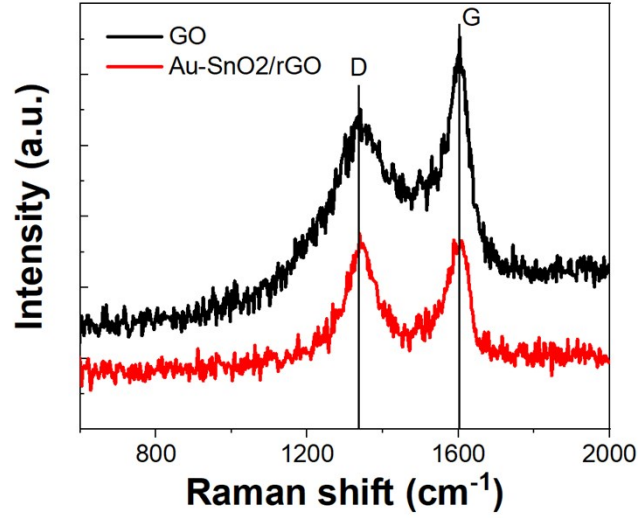


Figure S4. Raman spectral of GO and Au-SnO₂/rGO samples.

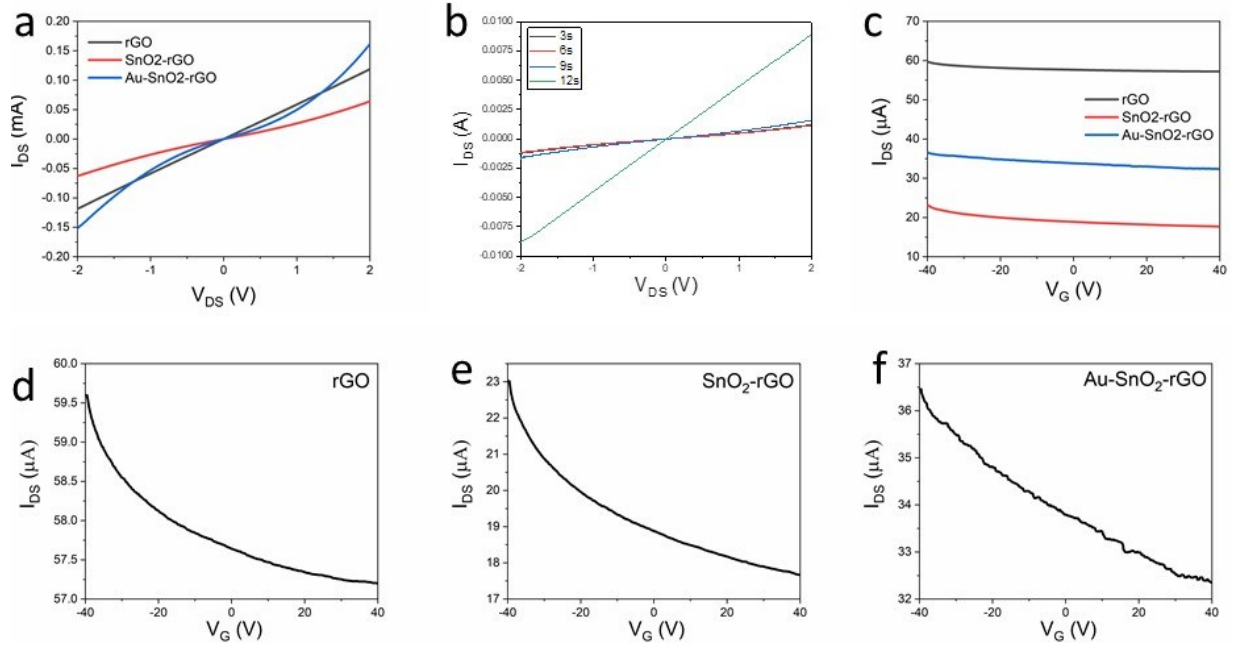


Figure S5. a-b) I-V curves and c-f) FET curves of the rGO, SnO₂-rGO, and Au-SnO₂/rGO sensors.



Figure

e S6. Prototype handheld device with the demonstration results.

Table S1. Quantitative Atomic ratio (%) analysis on the sputtered gold EDS results

| Element | Si | O | Au | C |
|---------|-------|-------|------|------|
| 6s | 61.82 | 29.61 | 0.05 | 8.51 |
| 9s | 61.44 | 29.36 | 0.06 | 9.14 |
| 12s | 63.15 | 29.72 | 0.08 | 7.05 |

Table S2. Comparison between the reported room temperature hydrogen sensors and our Au-SnO₂/rGO device

| Ref | Sensing Material | H ₂ % | Response ($\Delta R/R_0$) % | Response time (sec.) | Recovery time (sec.) | Temperature |
|------------------|---------------------------------------|------------------|-------------------------------|----------------------|----------------------|-------------|
| 1 | Pt-SnO ₂ /rGO | 1 | 200 in 1.5mins | 4 | 3 | 50 |
| 2 | Pd-MLGN | 0.8 | ~70 | ~5 | ~300 | RT |
| 3 | Pd nanowires | 1 | 5.9 | 16 | ~50 | RT |
| 4 | PMMA-Pd-G | 1 | 46 | ~60 | ~600 | RT |
| 5 | Pd/SnO ₂ /rGO | 1 | 55 | >100 | >1800 | RT |
| 6 | Pd@ZIF-8 | 1 | 3 | 8 | 10 | RT |
| 7 | Pd-SnO ₂ /MoS ₂ | 0.5 | 18 | <30 | <20 | RT |
| This work | Au-SnO₂/rGO | 1 | 47 | 60 | 180 | RT |

*The hydrogen exposure time for response % calculation are all converted to 5 mins, response time was defined as the time length to reach 90% of the total response in 5mins, recovery time was defined as the time over which 90% of the maximum response % is recovered.

References

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