Electronic Supplementary Material (ESI) for Materials Horizons.

Electronic Supplementary Information

Structural Engineering of Gold Thin Films with Channel Cracks for Ultrasensitive Strain Sensing

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Movie S1. Quick extinguishment of a LED.

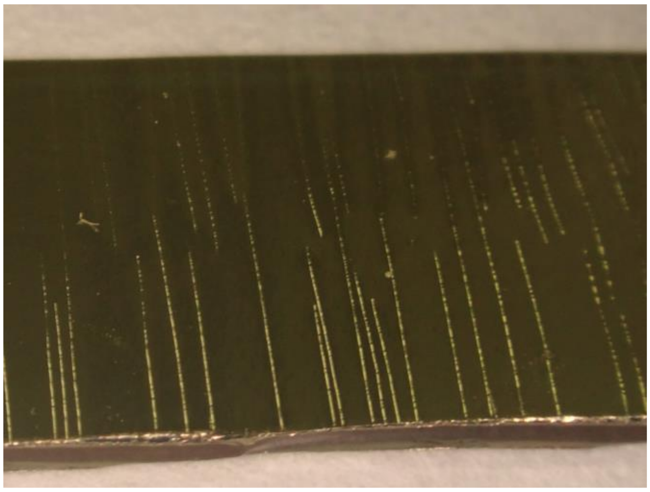

Figure S1. Channel cracks initiated at edges of the gold film.

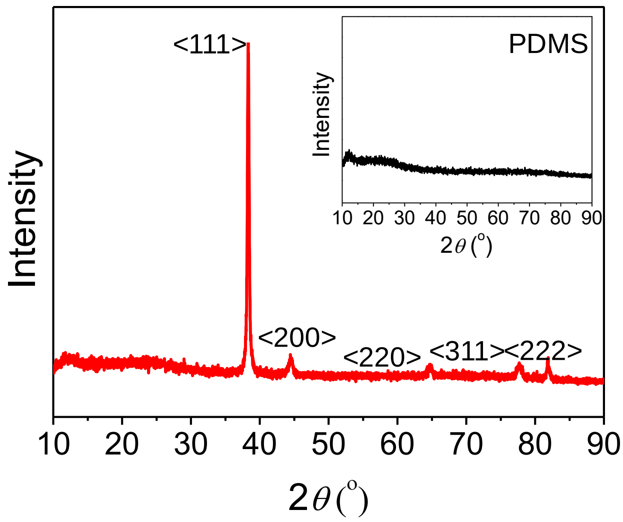

Figure S2. XRD characterization of the as-fabricated gold/PDMS assembly. The inset shows the XRD of the PDMS alone.

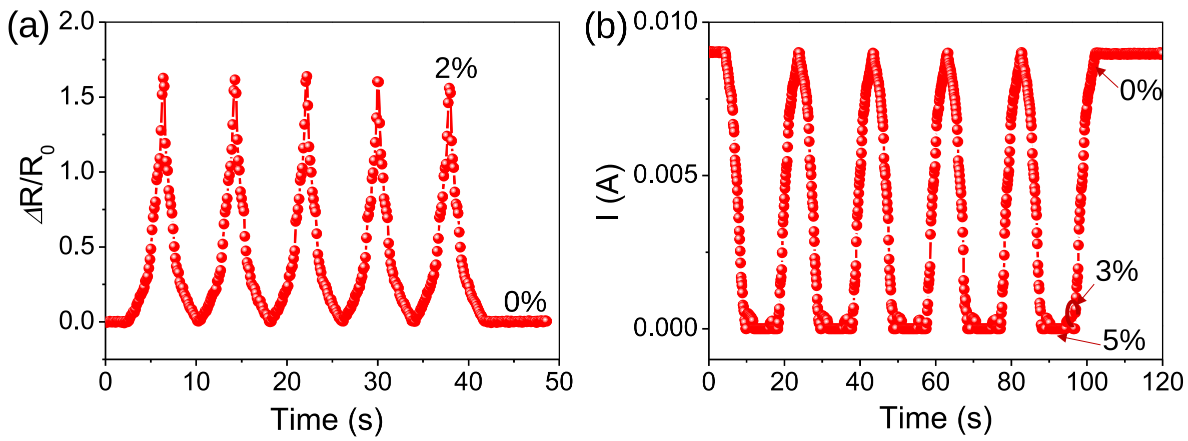

Figure S3. Pre-stretching the poorly adhered gold/PDMS when the strain was applied (a) from 0% to 2% and (b) from 0% to 5%.

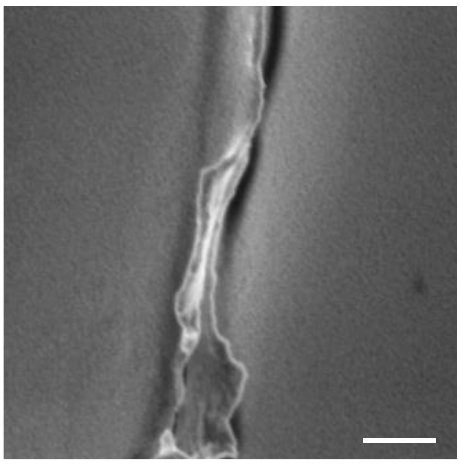

Figure S4. The whole crack is almost closed with crimp matching crack edges for pre-stretch at 60% strain (scale bar: 500 nm).

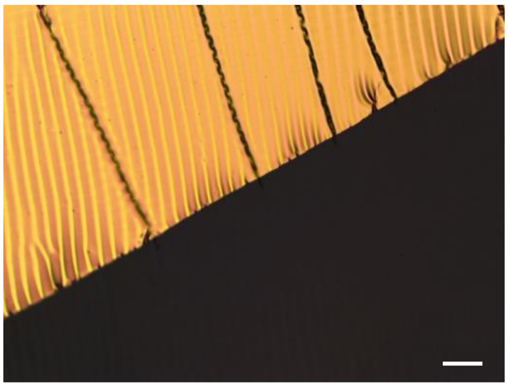

Figure S5. No obvious crack was generated inside PDMS upon pre-stretch when gold was absent (scale bar: 100 μm).

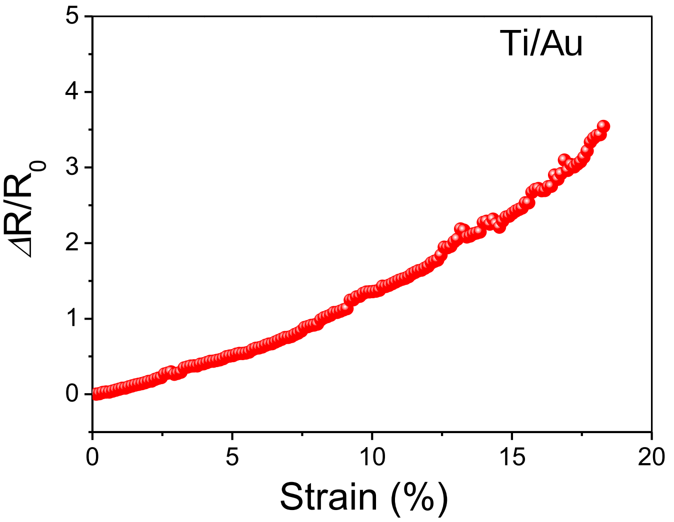

Figure S6. Electromechanical response of strongly adhered gold/PDMS demonstrating micro-crack distribution.

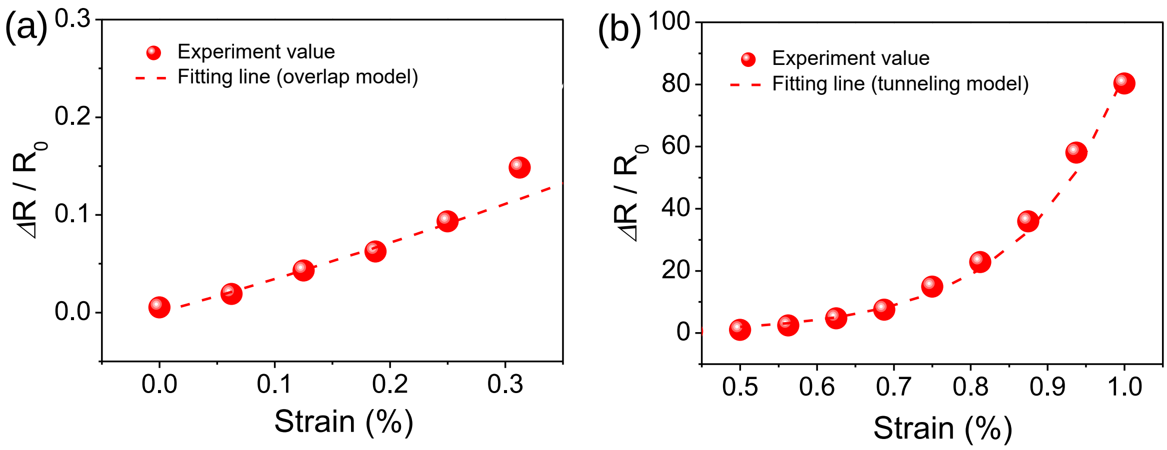

Figure S7. (a) Overlap model matches experiment value well when the strain was applied from 0% to ~0.3%. (b) Tunneling model matches experiment value well when the strain was applied from 0.5% to ~1%.

Table S1. Comparison of strain sensors regarding their gauge factors for weak deformation.

Sensing element	Gauge Factor ($\varepsilon < 1\%$)	Stretchability	Ref.
Channel cracks-based gold	~5000	1%; 10% when connected in parallel with graphene	This work
PECVD grapheme	600	2%	S1
Graphene rubber composites	10	800%	S2
Graphene woven fabrics	500	10%	S3
Mechanically exploited grapheme	1.9	3%	S4
Cracks-based Pt sensor	~800	2%	S5
Liquid metal	3	250%	S6
Monolayer Au nanoparticle	300	0.3%	S7
Aligned carbon nanotube thin film	~0	280%	S8
Cross-stacked super-aligned carbon nanotube	0.1	35%	S9
Thickness-gradient films of CNTs	~100	150%	S10
ZnO nanowire/polystyrene hybridized flexible films	10	50%	S11
ZnO piezoelectric fine-wires	1200	1.2%	S12

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