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Supporting Information

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Multi-Dimensional Mechanical Mapping Sensor Based on Flexoelectric-Like and Optical Signals

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Supporting Information

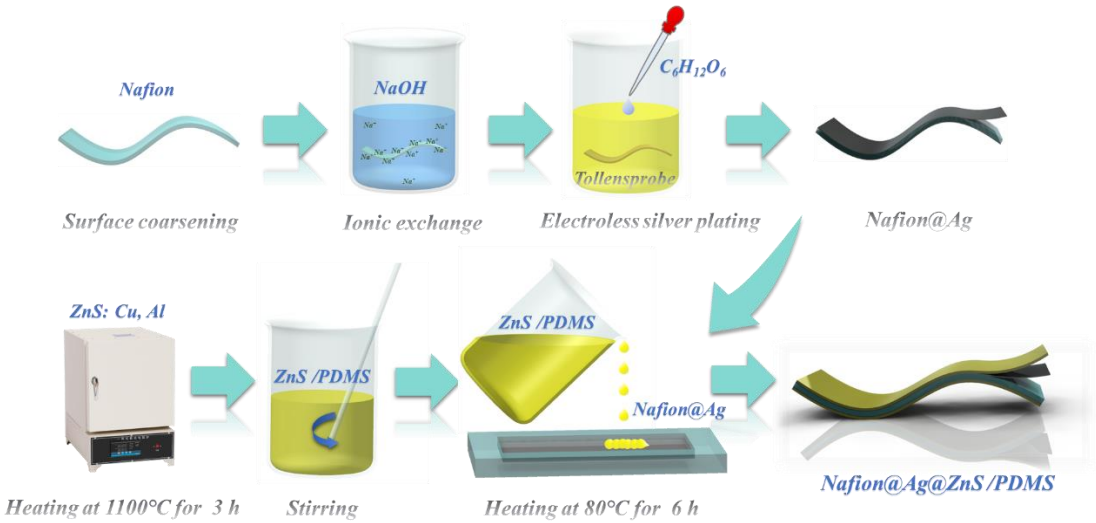

Figure S1. Schematic diagram of the preparation process of Nafion@Ag@ZnS/PDMS composite film.

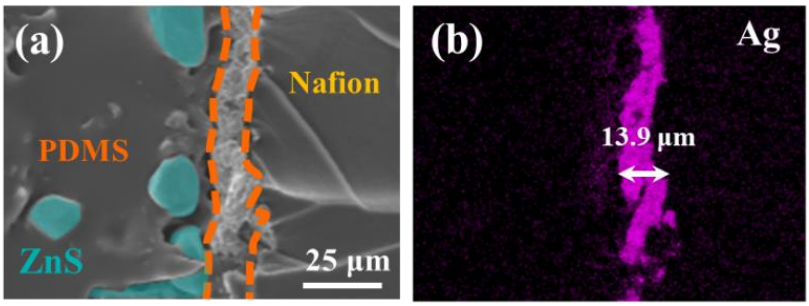

Figure S2. The enlarged SEM images of Ag layer.

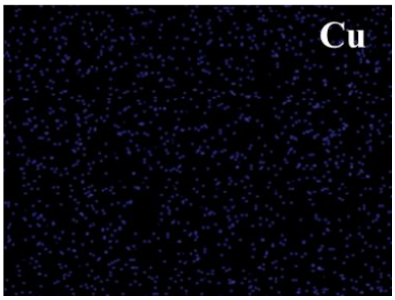

Figure S3. The elemental mapping image of Cu.

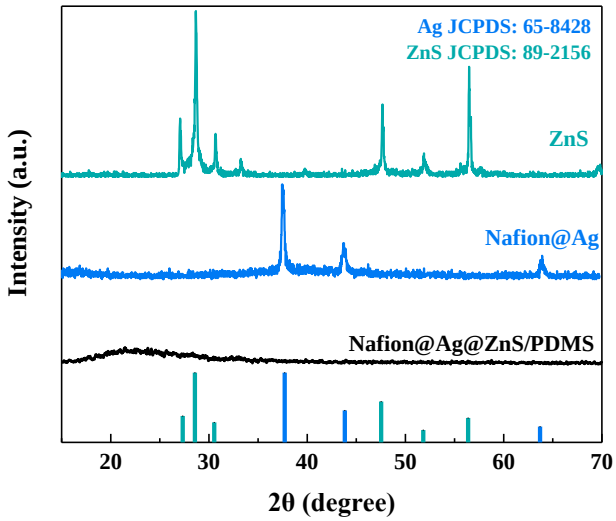

Figure S4. XRD patterns of Nafion@Ag, ZnS, and Nafion@Ag@ZnS/PDMS film, respectively.

Table S1. Summary of mechanical sensors and their performance parameters.

Materials	Device Type	Sensor detection information	Response time	Cyclic stability	Response linearity	References
Nafion@Ag@ZnS/PDMS	Flexoelectric-like and ML	Magnitude of force, Direction, Velocity, Mode, Stress distribution	5.82 ms	＞300	R^2=0.99	This work
CB/Mxene/PDMS composites	Rriboelectric signals	Differentiate the normal and shear forces	0.26 s	28000	R^2 = 0.9773	[1]
Laser-induced graphene/PDMS	Electromechanical	Sportswear	210 ms	30000	R^2=0.99	[2]
ZnS−CaZnOS	ML	Temperature and pressure		2300/8000	R^2=0.99	[3]
Pressure-sensitive conductive sheet/FPCB	Piezoelectricity	Six-dimensional force perception			linearity error ＜0.008	[4]
Ag/SiO_2; ZnS:Mn/PDMS	ML and triboelectric	Full dynamic-range pressure	9.23 ms		linear relationship (the slope is 0.029 MPa^{-1})	[5]
Polymer gel	Piezoionic mechanisms	Force 0.01 to 100 nV/Pa	2 ms			[6]
3D capacitive sensor with a seesaw-like shape	Capacitive sensor	Force and acceleration measurement		50	approximate linear correlation	[7]
A carbon flower	Resistance	Pressure sensing		1000	0.025 N	[8]

and elastomer composite						
Pyramid microstructured dielectric layer	Capacitive	Pressure sensors	25 μm	2000	pulsations at 43 bpm	[9]
Biodegradable materials	Piezoelectricity	Strain sensor	A response time in the millisecond range	30000	0.89	[10]
Flexible sensing arrays (PDMS /Ni-Au)	Piezoelectricity	Strain sensor	25 ms	4000		[11]
Nacre-mimetic multi-layered silver nanowires /reduced graphene oxide /thermoplastic polyurethane mats	Piezoresistance	Contact-Noncontact Sensing	20 ms	11000	0.967	[12]
ZnS:Mn	ML	personalized pressure information	10 ms	＞10000	obvious linearly increasing trend	[13]

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