Supporting Information

High stable and ultra-fast vibration-responsive flexible iontronic sensors for accurate acoustic signal recognition

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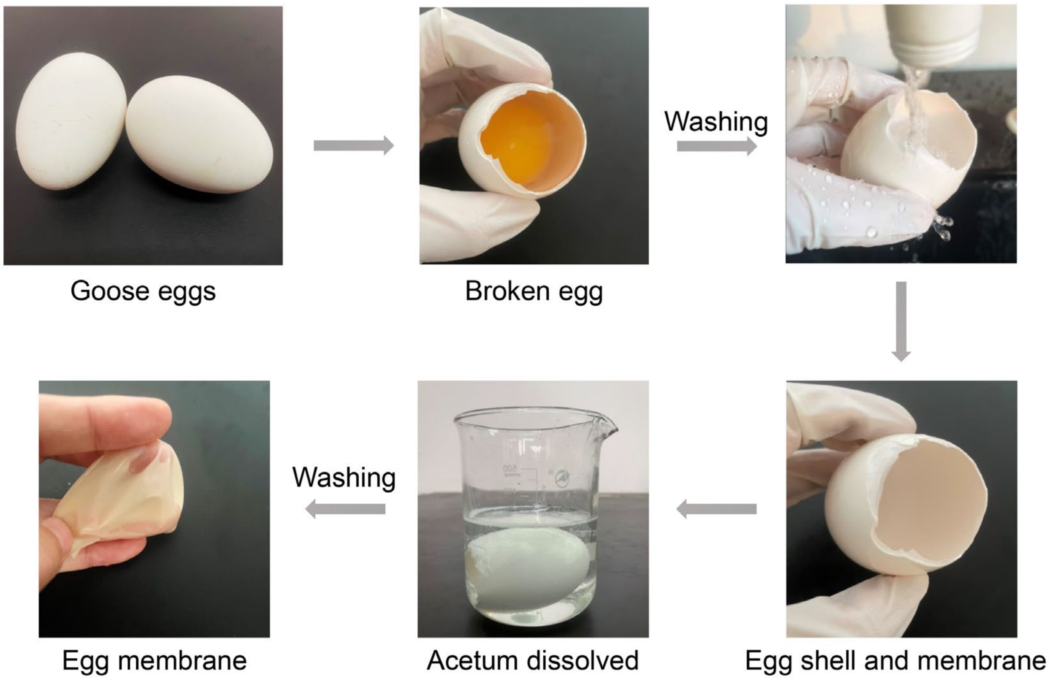

Figure S1. Protein micro-fibers derived from microstructured goose eggshell inner membrane.

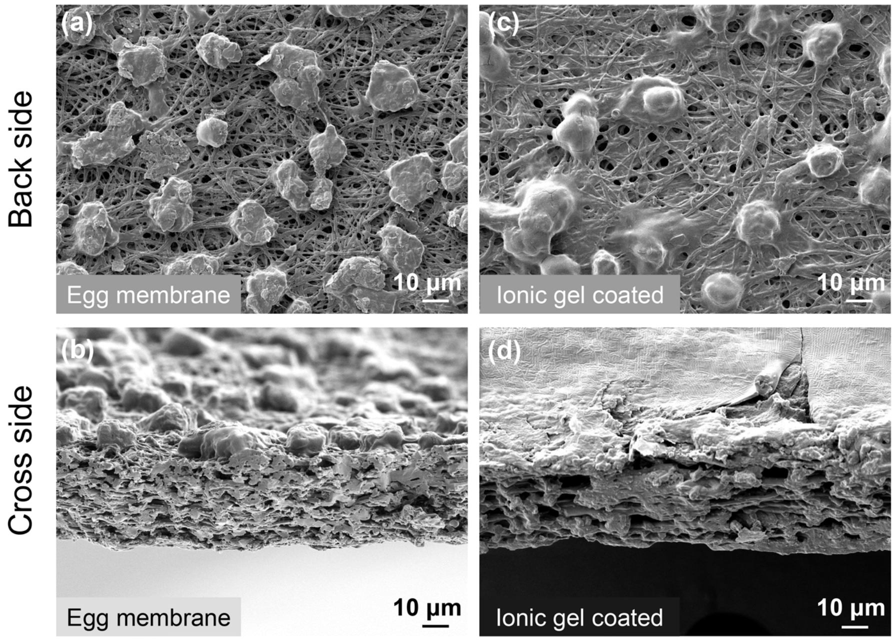

Figure S2. SEM image of the eggshell membrane ionic gel coated eggshell membrane.

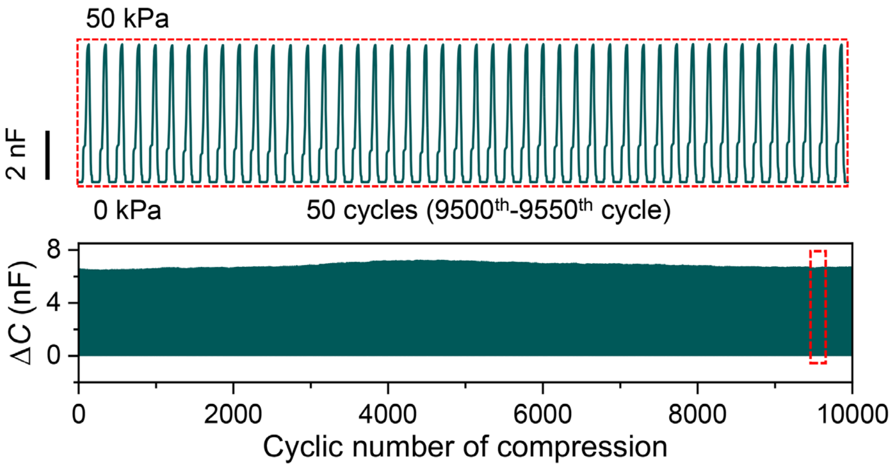

Figure S3. Signal stability over 10,000 compression/release cycles at 50 kPa. The inset shows reversible responses from 9500 to 9550 cycles.

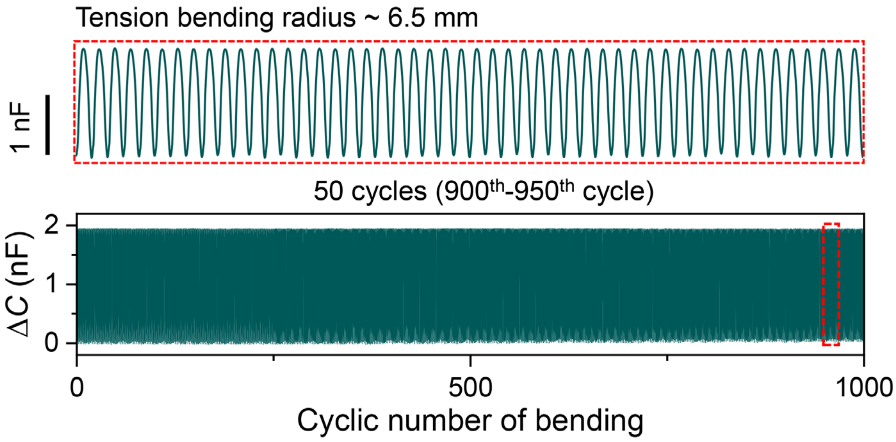

Figure S4. Signal stability over 10,00 bending cycles under a bending radius of ~ 6.5 mm. The inset shows reversible responses from 900 to 950 cycles.

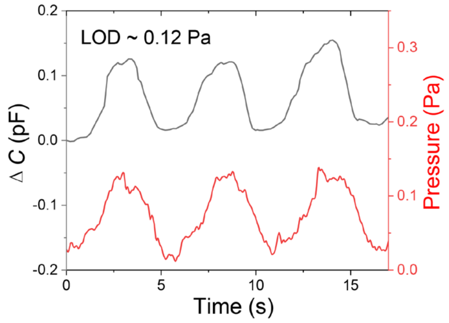

Figure S5. The Limit of detection (LOD) of the acoustic sensor.

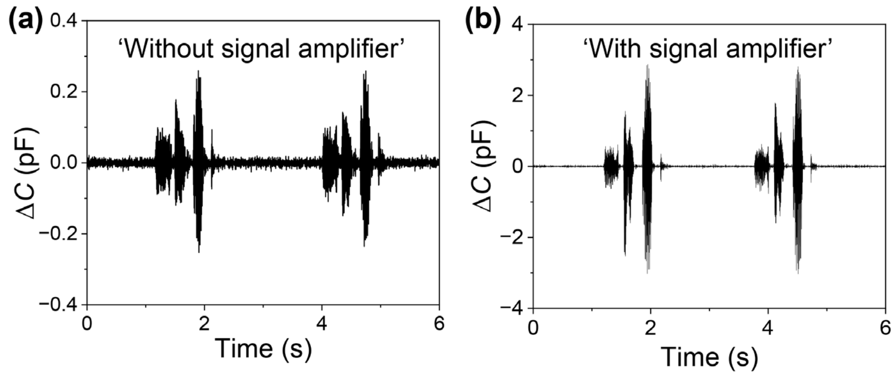

Figure S6. The acquired acoustic signal with and without signal amplifier.

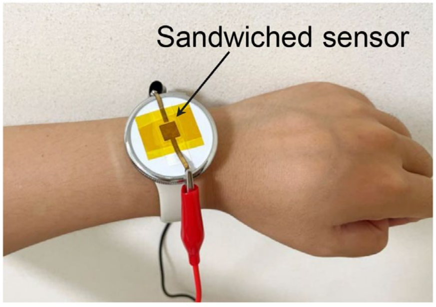

Figure S7. The acoustic sensor is embedded on the bracelet for sensing.

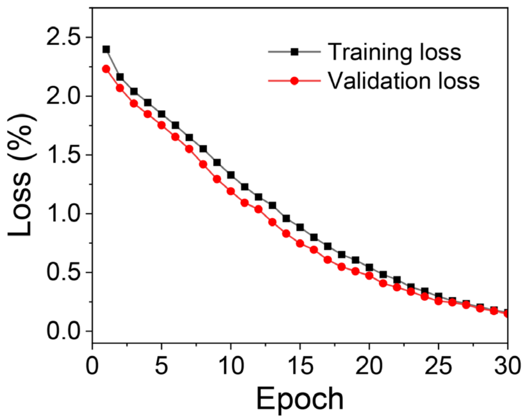

Figure S8. The training and testing accuracy curves of the loss function.

Table S1. The response and relaxation time of our sensor and previously reported flexible pressure sensors are listed.

Materials	Interface bonding	Response time (ms)	Relaxation time (ms)	Durability (cycles)	Limit of detection (Pa)	Reference
PVA/H_3PO_4 hydrogel	/	9	18	5,000	0.08	Ref [25]
$Ti_3C_2T_x$/NMC	/	14	16	5,000	8	Ref [28]
PVA/H_3PO_4 hydrogel	/	2.74	4.11	10,000	10	Ref [29]
Graphene/PDMS sponge	/	74	67	3,000	100	Ref [30]
rGO/PDMS	/	150	40	4,000	~10,000 Pa	Ref [31]
MXene/PU composite	/	68.4	46.5	10,000	7.8	Ref [32]
CNTs/PDMS composite	/	6	6	10,0000	0.35	Ref [33]
PVDF@AgNWs @TiO_2	/	166.9	199	30,000	10	Ref [34]
Cr/Cu-coated PDMS	No bonding	100	200	10,000	139.6	Ref [35]
Ionic liquid coated PVDF	No bonding	40	78	5,000	0.4	Ref [36]
CNTs coated FEP textile	No bonding	23.3	40	10,000	10	Ref [37]
PVA/H_3PO_4-coated eggshell membrane	Hydrogen bonding	0.6	0.6	10,000	0.12	This work