Supporting Information

Title: Soft, Flexible Pressure Sensors for Pressure Monitoring

Under Large Hydrostatic Pressure and Harsh Ocean Environments

Yi Li[a#], Andres Villada[b#], Shao-Hao Lu[a],
He Sun[c], Jianliang Xiao[b], Xueju Wang[a,d]**

[a] Department of Materials Science and Engineering, University of Connecticut, Storrs, CT 06269, USA

[b] Department of Mechanical engineering, University of Colorado, Boulder, CO 80309, USA

[c] Department of Biomedical Engineering, University of Connecticut, Storrs, CT 06269, USA

[d] Institute of Materials Science, University of Connecticut, Storrs, CT 06269, USA

*Corresponding author. Email: xueju.wang@uconn.edu; jianliang.xiao@colorado.edu

# Yi Li and Andres Villada contributed equally to this paper.

Supplementary note 1: The modulus and thickness of each layer of the temperature and salinity sensor is summarized in **Table S1**. Based on equation (1), we calculated the effective modulus for the multi-layer sensor.

$$\bar{E} = h^{-1}\left(\sum_{i=1}^{N} E_i h_i\right) \tag{1}$$

Here, h (21.31 μm) is the total thickness of the sensor, and h_i and E_i are the thickness and modulus of each layer respectively, as listed in **Table S1**. The effective modulus of the sensor is determined to be 3.66 GPa.

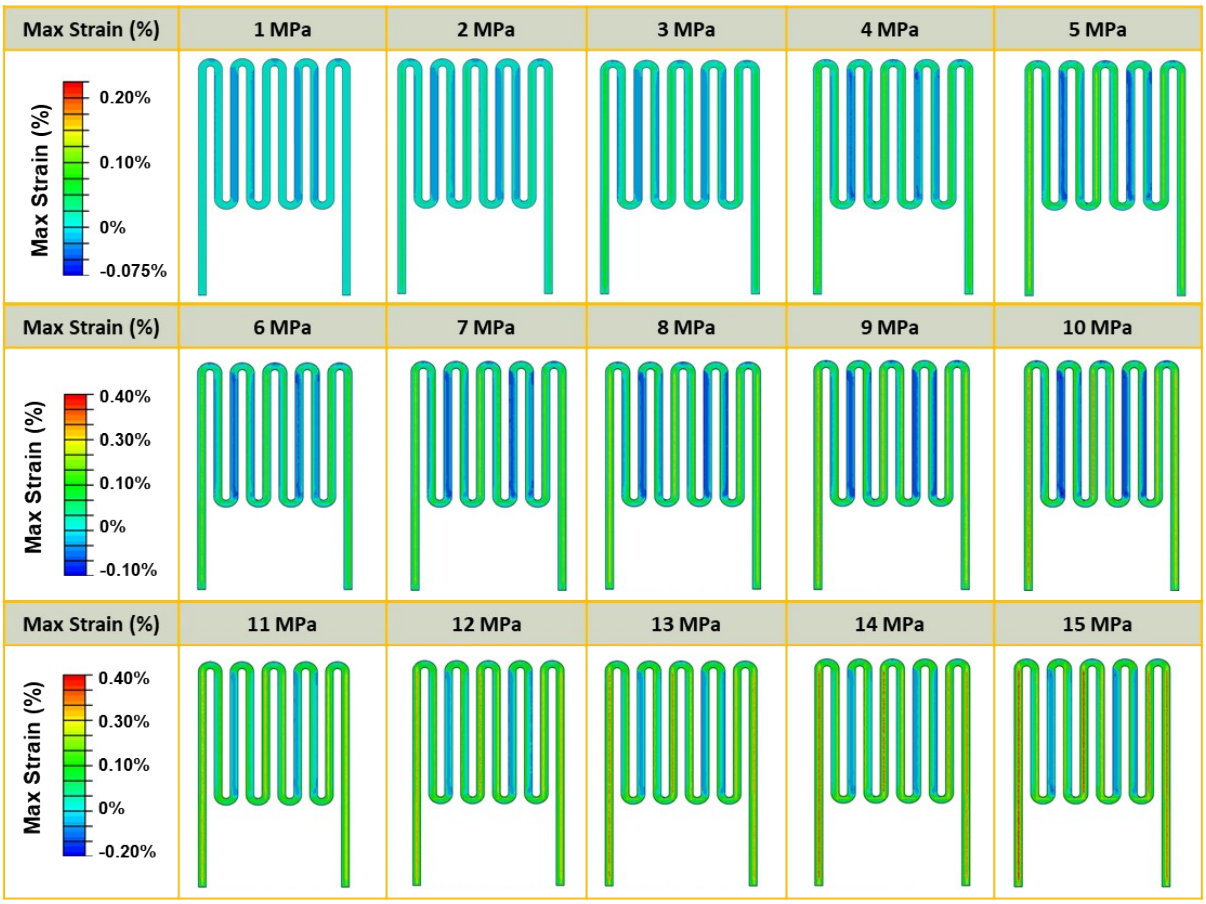

Figure S1. Simulation results of strain distributions in the rectangular pressure sensor under hydrostatic pressures from 1 MPa to 15 MPa.

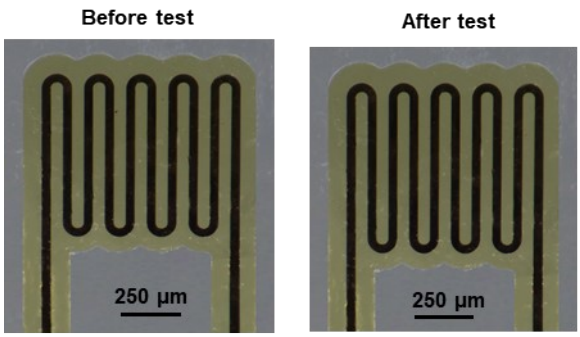

Figure S2. Optical microscope images show the comparison of the rectangular pressure sensor before and after cyclic loadin test.

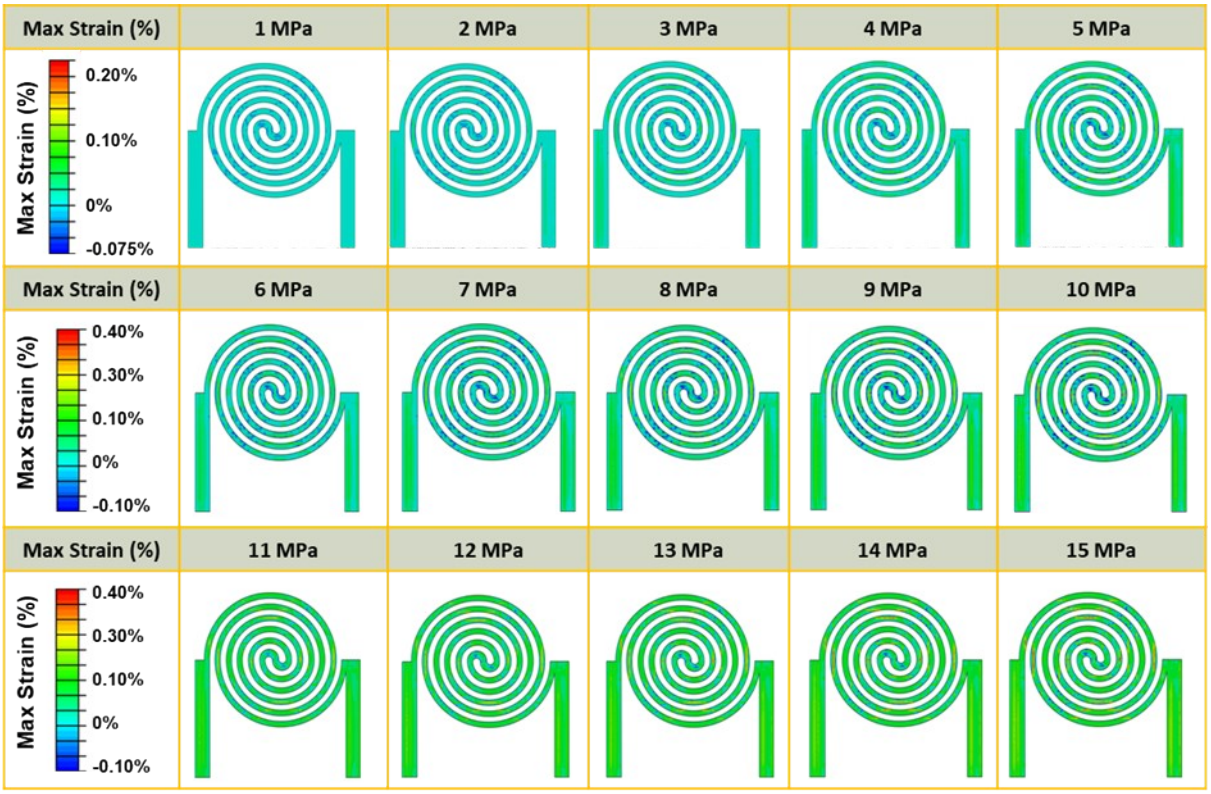

Figure S3. Simulation results of strain distributions in the circular pressure sensor under hydrostatic pressures from 1 MPa to 15 MPa.

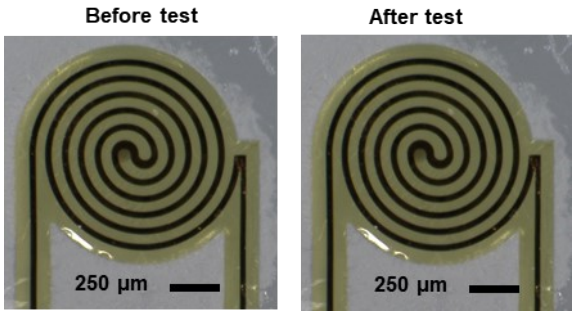

Figure S4. Optical microscope images show the comparison of the circular pressure sensor before and after cyclic loading test.

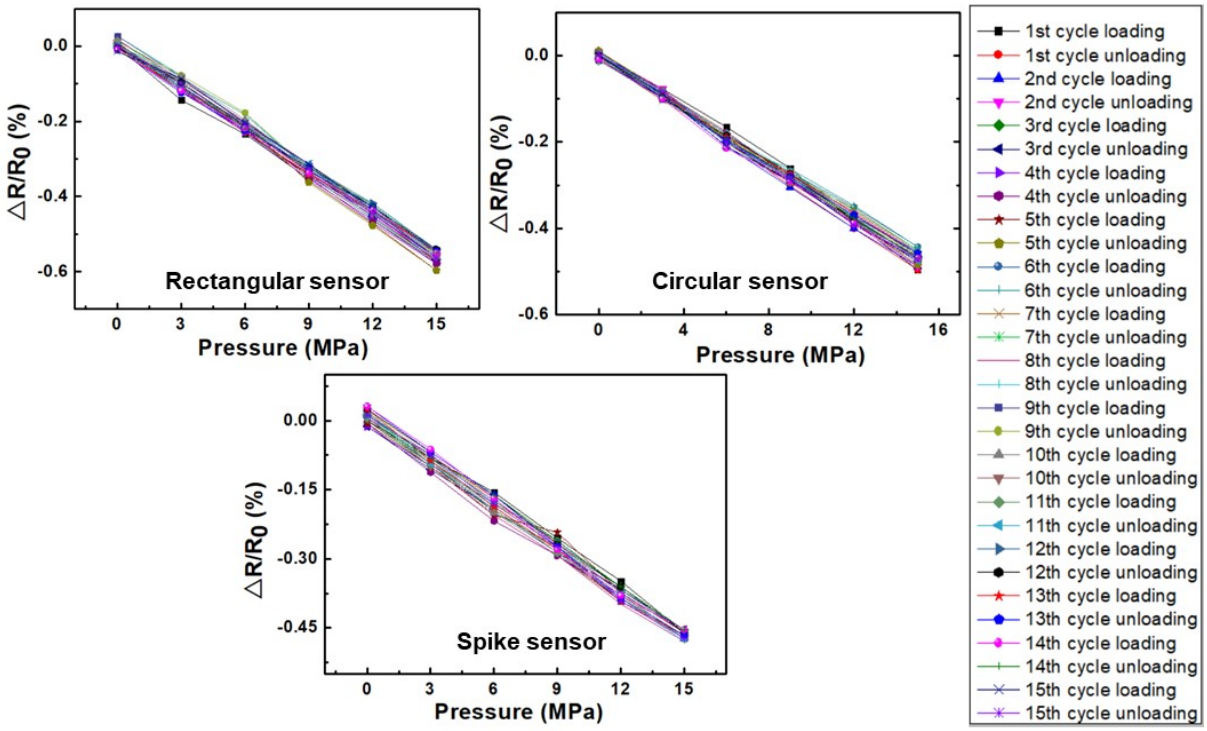

Figure S5. 15 cyclic loading/unloading test resutls of pressure sensors in rectangular, circular and spike shapes, respectively.

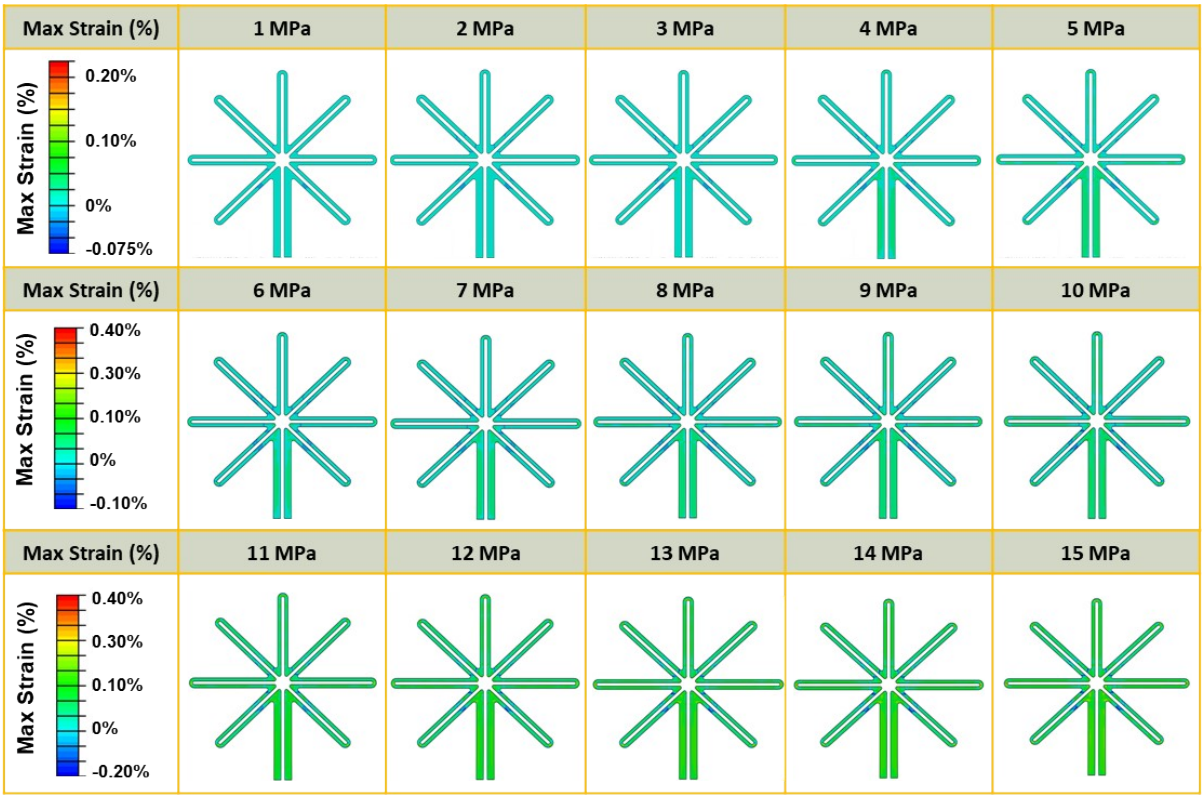

Figure S6. Simulation results of strain distributions in the spike pressure sensor under hydrostatic pressures from 1 MPa to 15 MPa.

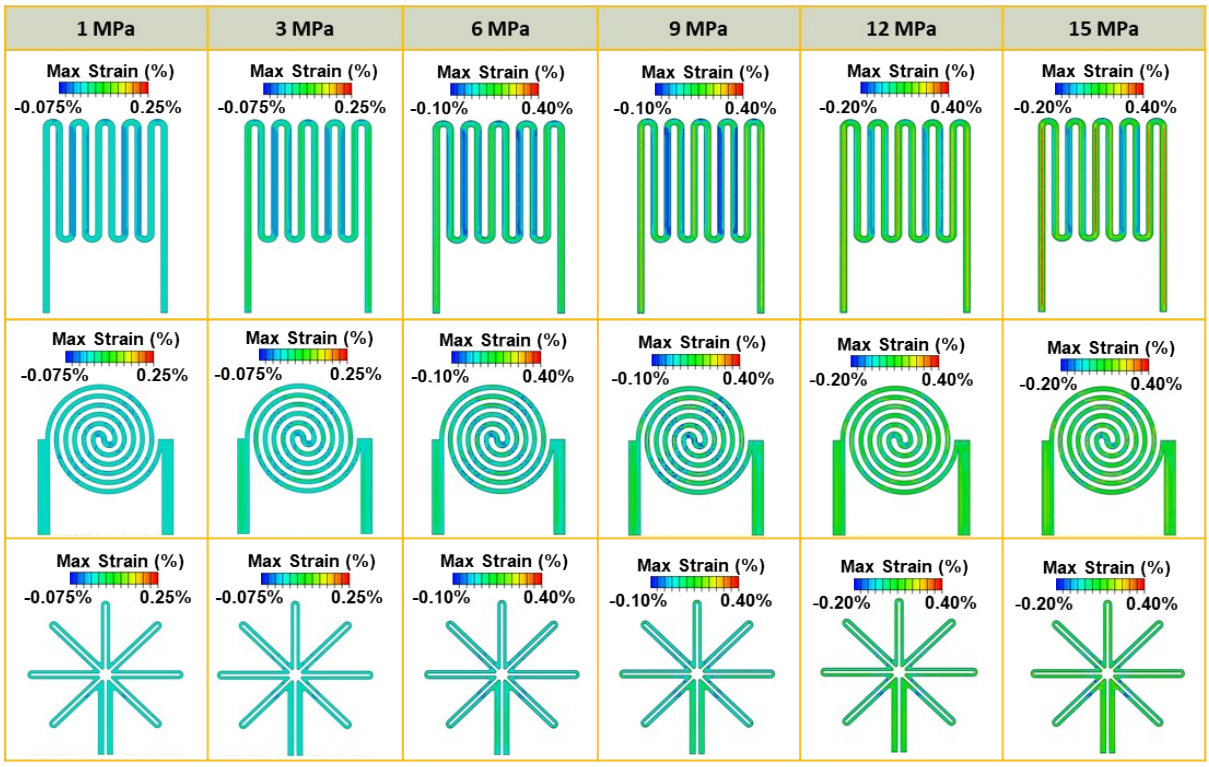

Figure S7. Comparison of strain distributions in the rectangular, circular, and spike pressure sensor under hydrostatic pressures from 1 MPa to 15 MPa.

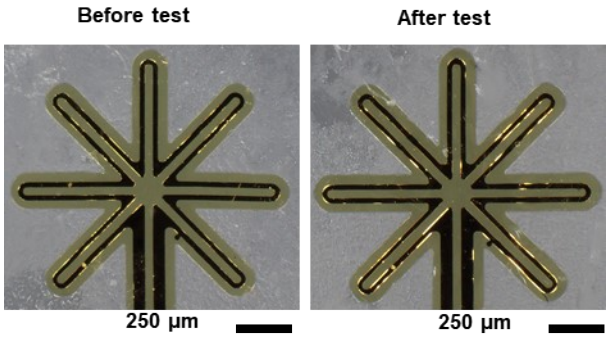

Figure S8. Optical microscope images show the comparison of the spike pressure sensor before and after cyclic loading test.

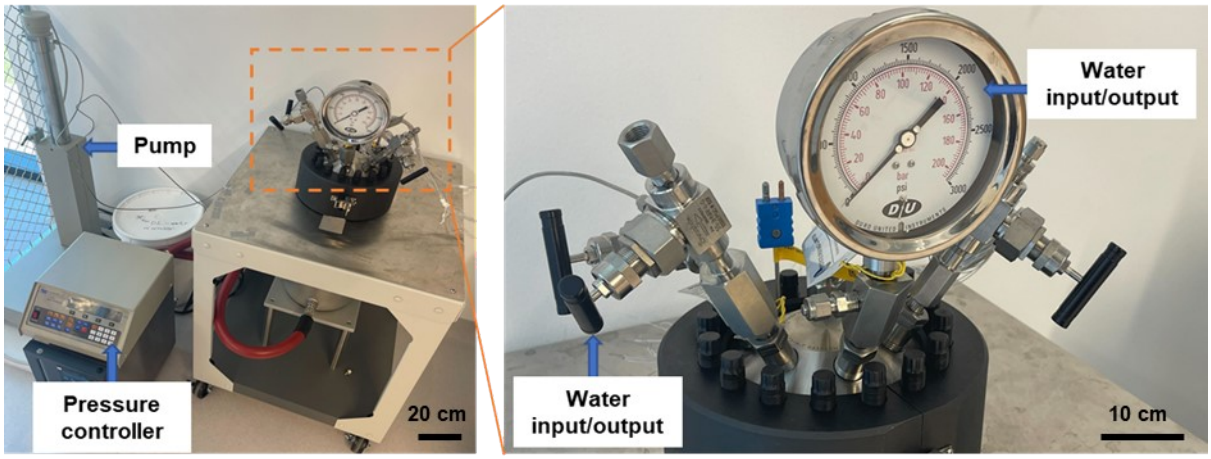

Figure S9. Optical image of the setup for the pressure vessel, pump, and chiller.

Table S1. The modulus and thickness of each layer of the sensor.

Layers	**Young's modulus (MPa)**
Polyimide (7.6 μm thick)	2500
Cr (10 nm thick)	140000
Au (100 nm thick)	78000
Polyimide (7.6 μm thick)	4020
Parylene C (6 μm thick)	3200