

Dewetting Process of Silver Thin Films and Its Application on Percolative Pressure Sensors with High Sensitivity

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The analytical model of the central deflection for a circular membrane with clamped edge under a uniformly distributed load [38] is shown in Equation S1. This analytical model can be used to approximately estimate the force-deformation relationship of the membrane of the proposed sensors. The schematic of the membrane is shown in Figure S1.

$$d = \frac{pr^4}{64D} \quad (S1)$$

where d is the central deflection of the membrane, D is the flexural rigidity, r is the membrane radius, and p is the uniformly distributed load.

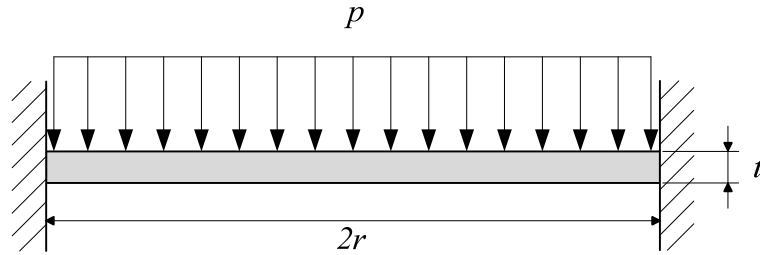


Figure S1. The cross-sectional schematic of a circular membrane with clamped edge under a uniformly distributed load.

According to Equation S1, the central deflection is proportional to r^4 . Therefore, the average strain of the membrane is proportional to r^3 (i.e., d/r). Since the sensor response is proportional to the strain, the sensor response is also proportional to r^3 . Therefore, under the same distributed load p , the device with a larger membrane diameter gives larger sensor response than the device with a smaller membrane diameter. Consequently, the device with a larger membrane diameter possesses a larger sensitivity. This brief modeling will be added in the supplementary material.

References

- [38] S. Timoshenko and S. Woinowsky-Krieger, Theory of plates and shells. McGraw-hill New York, 1959; pp. 51-58.