

Fabrication and Characterization of Microscale Sensors for Strain
Measurement in Flexible Polymer Heart Valve Leaflet

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Abstract

Flexible polymer heart valves are promising clinical prostheses for replacement of diseased or malfunctioned natural heart valves. However, the flexible polymer leaflets are prone to fatigue fracture, which hinders their practicality in clinical applications. In this study, microstrain sensor

(gauge) for strain measurement is designed in the polyurethane (PU) thin film to measure the stress/strain in situ. In our design, the strain gauge is embedded in PU, which is different than the commercial strain gauge of sticking to the sample. The metal layer of strain gauge used in this study is gold. The overall size of the designed strain gauge is $1\text{mm} \times 1\text{mm} \times 0.1\text{mm}$, and the resistance value was measured to be 200 ± 30 .

The static test of strain gauge without damp proof shows that gauge sensitivity G was measured to be 4 and 1.8, when strain range is less than 1%

and between 1 - 1.5%, respectively, while the static test of strain gauge with damp proof shows that gauge sensitivity G was measured to be 2.6 when strain range is less than 1.2%. The dynamic test of strain gauge was also applied in this study.

Keyword : Microfabricated strain gauge; Polyurethane; Strain distribution measurement