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Bending Mode Ionic Polymer-Metal Composite (IPMC) Pressure Sensors

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Abstract— Ionic polymer-metal composites (IPMCs) due to their appropriate properties

such as flexibility, light weight, easy processing, resilience and high sensitivity have attracted

more attentions in recent years. Although there are several studies on basic characteristics of

these transducers, developments of IPMC sensors for specific applications are relatively rare.

The purpose of this paper is to design dynamic pressure IPMC sensors based on streaming

potential hypothesis and calibrate them in a standard shock pressure tube. For this goal, after

explaining sensing mechanism based on streaming potential hypothesis for a circular IPMC

sensor, direct assembly process (DAP) is applied to fabricate some pressure sensor samples.

By estimating equivalent resistance and capacitance of the samples using impedance

analyzer, a signal conditioner is designed. A shock tube setup is then utilized for test the

performance of the fabricated pressure sensors. Analyzing the results shows that IPMCs as

dynamic pressure sensors represent an appropriate linearity, sensitivity and reliability and

DAP is a consistent fabrication process for making this category of sensors.

Key words: Ionic polymer, pressure sensors, dynamic sensors

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