Design, Fabrication, and Packaging Processes of MEMS Acoustic Vector Sensor (AVS) for Underwater Application

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Abstract

MEMS Acoustic Vector Sensor (AVS) is biomimic of fish lateral line sensor used for underwater applications in Autonomous Underwater Vehicles. It is designed to provide accurate positioning and object information of underwater species. Bio-inspired acoustics is the scientific study of natural and artificial sounds that propagate underwater. The study includes sensing acoustic signals for variety of applications such as sonar to locate submarines, underwater communication by whales, climate change monitoring by measuring sea temperatures, sonic weapons and marine bioacoustics. The design acoustic sensor work based on the piezoresistive sensing principle. This paper describes the design, fabrication, characterisation and packaging of a two-dimensional artificial lateral line formed by novel piezoresistive MEMS acoustic sensors. The ability of the two-dimensional array of the piezoresistive hair cell sensors to locate an underwater stimulus is validated through detailed experimental analysis. The availability of artificial sensors that emulate the lateral lines of fish could bring a significant enhancement in the control and manoeuvring abilities of AUVs.

Keywords: Acoustic sensors, piezoresistive, MEMS, bio-inspired, directional acoustic sensor

References

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Figures

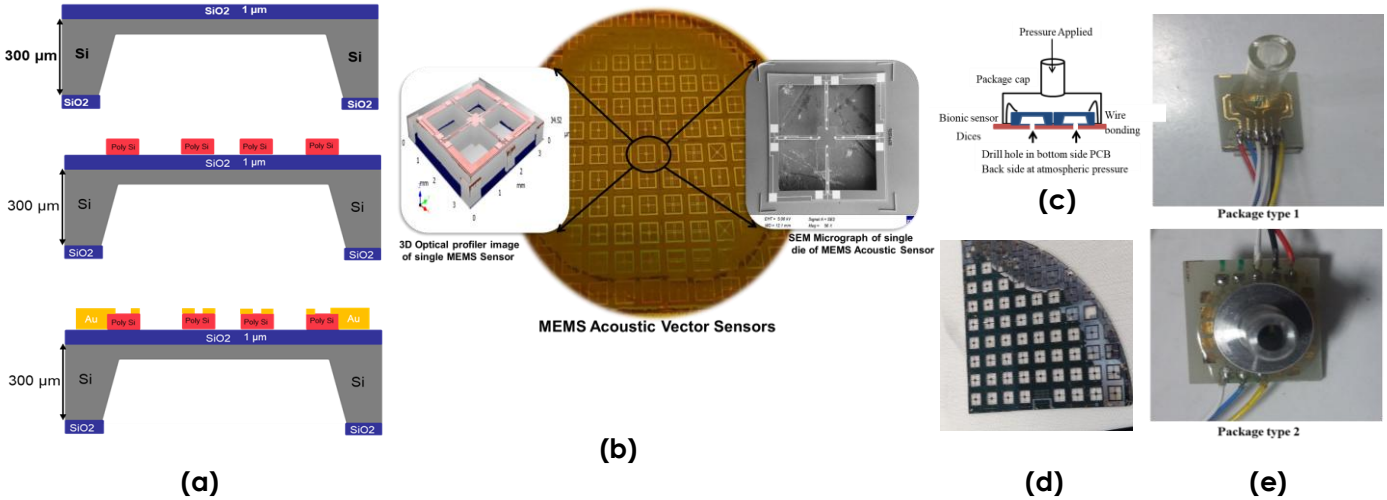

Figure 1: MEMS Acoustic Vector Sensors (a) Fabrication process flow, (b) Fabricated sensors, (C) Packaging Design, (d) Released microsensor structure and (e) Packaged diced for measurement