

Design and Simulation of a Cantilever Array for Fluid Flow Sensing Applications

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Abstract

The biological hair-cell is a modular building block of a rich variety of biological sensors. These sensors are responsive to various mechanical properties like vibration, touch, gravitational forces, etc., especially flow. Using micro and nano-fabrication technology, an engineering equivalent of such sensors have been reported to be fabricated, imitating the structure and transfer function of the biological hair-cell. This study aims at the design and simulation of such artificial hair-cell sensor using MEMS module of COMSOL Multiphysics which can lead to a better understanding of biological hair-cells and their role in sensing. The design consists of an array of Silicon beams fixed at one end and the corresponding out-of-plane beams attached to the distal end of the horizontal beams were designed to be made of polyimide. The physics used to simulate the working condition of the sensor was Fluid Structure Interaction. By this study, parameters that are influenced by the flow rate of the fluid, such as displacement, pressure, stress-strain, etc can be evaluated. A comparison between the efficiencies of this design and conventional cantilever beams has also been made in this study.

Reference

Liu, C., Micromachined biomimetic artificial haircell sensors, *Bioinspiration and Biomimetics*, 2(2007)S162-S169.

Figures used in the abstract

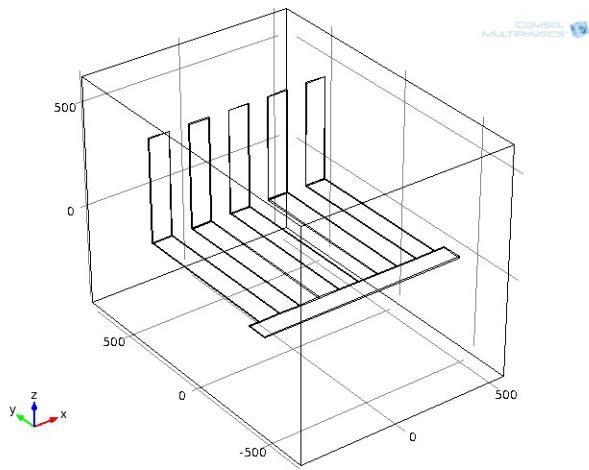


Figure 1: Design of extruded geometry of the sensor.