Combining COMSOL modelling with different Piezoelectric Materials to design MEMS cantilevers for marine sensing robotic

Dr. Basit Abdul
Sabanci University, Nanotechnology Research, and Application Center
Istanbul Turkey

Mr. Abul Hasan Shibly
Department of Textile Engineering
National Institute of Textile Engineering and Research Dhaka-1350, Bangladesh

Dr. Abdul Rab Asary
University of Naples Parthenope, 80133 Napoli, Italy
Outline

01. Introduction and objective of work, Approach/Bionic Principle/Application

02. Designing of Piezoelectric Cantilevers on COMSOL

03. Simulation and modeling of Cantilevers

04. Result
Aim of the Work

Novelty

✓ To design an innovative transducer by piezoelectric materials which will sense the intensity and directionality of underwater acoustic pulses.

✓ The device will have a wider frequency range. This wider frequency range is necessary for the dynamic range of signals for marine sensing acoustics.

✓ It will show a good directionality pattern, which helps to detect the acoustics source direction in the water.

Approach/Bionic Principle/Application

➢ A biomimetic approach inspired by Fish lateral line system
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### Materials Properties

<table>
<thead>
<tr>
<th>Materials</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platinum (Pt)</td>
<td>200 nm</td>
</tr>
<tr>
<td>Aluminum (Al)</td>
<td>200 nm</td>
</tr>
<tr>
<td>PZT, ZnO, BaTiO3</td>
<td>1 µm</td>
</tr>
</tbody>
</table>

### Dimension

<table>
<thead>
<tr>
<th>Length (µm)</th>
<th>Width (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100, 200, 300, 40, 50, 600, 700, 800, 900, 1000</td>
<td>50</td>
</tr>
</tbody>
</table>
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Figure 2. (a) Simulated microcantilever with deformed position. (b) Side view of micro cantilevers. (C) Face to face configuration of microcantilever.
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Figure 2. (a) Microcantilevers displacement vs Length with different piezoelectric materials (b) Microcantilever Voltage response vs Length with different piezoelectric materials