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

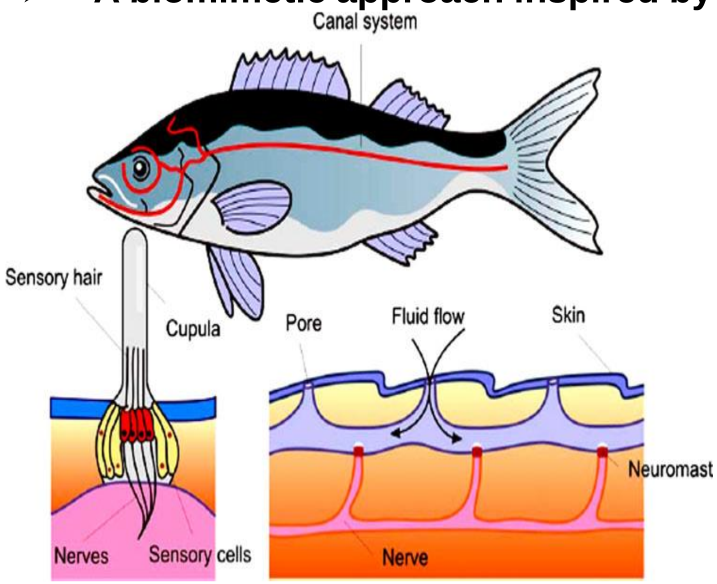
04 Result

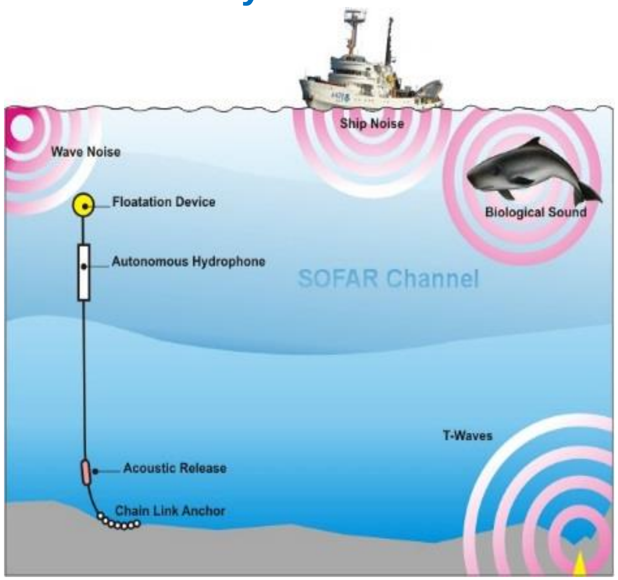
Aim of the Work
Novelty

- ✓ 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.

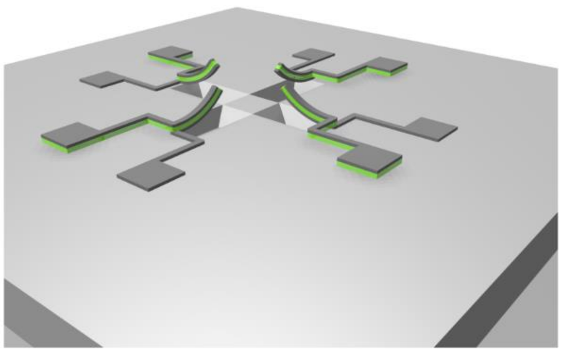
Approach/Bionic Principle/Application

- ➢ A biomimetic approach inspired by Fish lateral line system





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

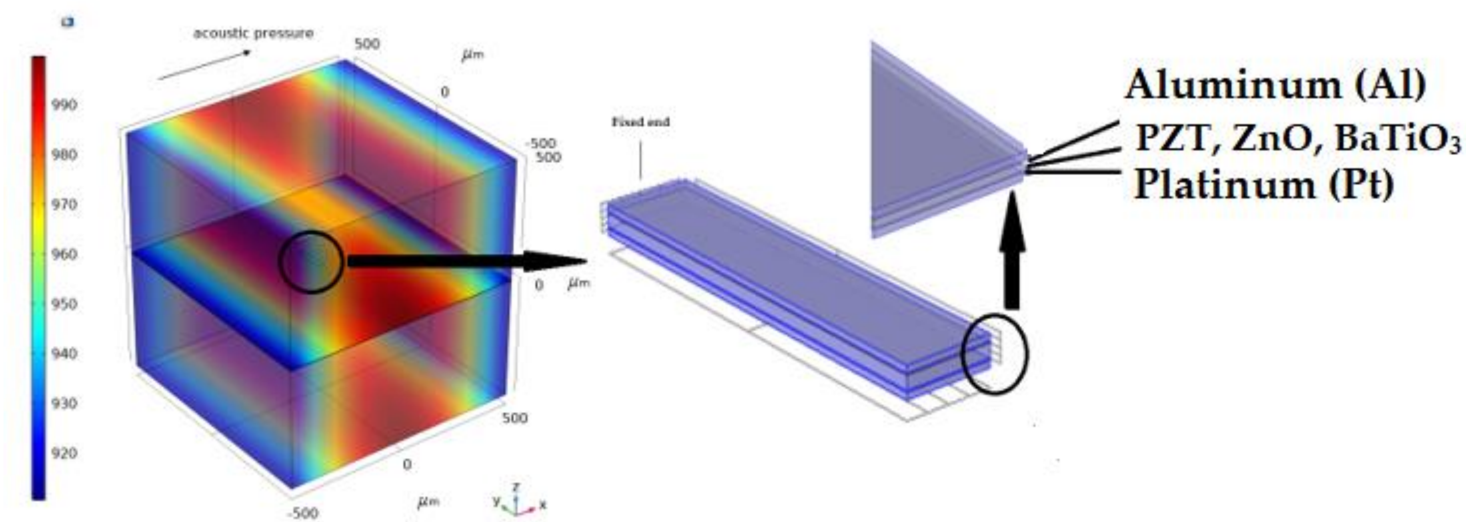


Materials Properties

Materials	Thickness
Platinum (Pt)	200 nm
Aluminum (Al)	200 nm
PZT, ZnO, BaTiO3	1 µm

Dimension

Length (µm)	Width (µm)
100,200,300,40,500,600,700,8009 00,1000	50



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

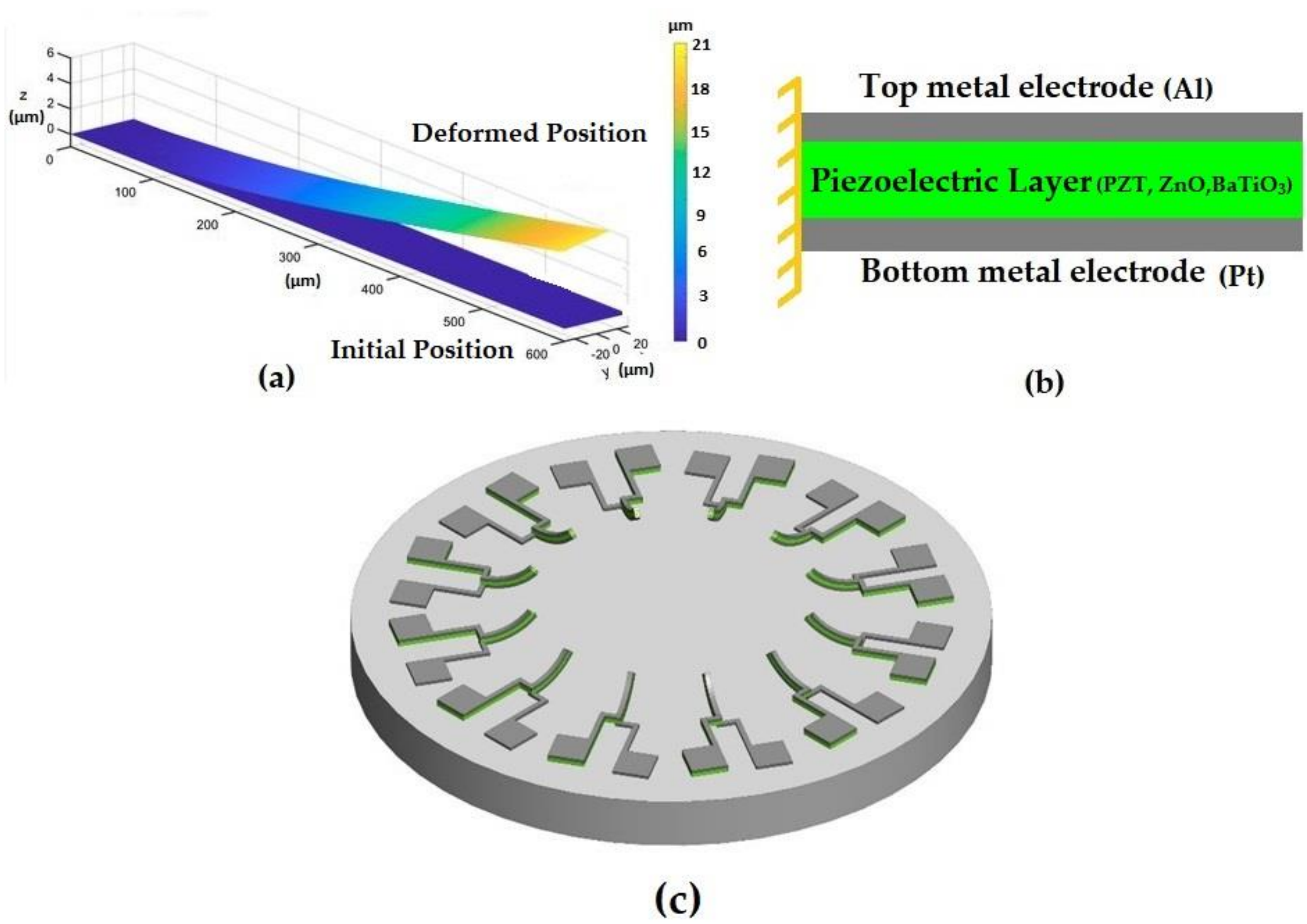


Figure 2. (a) Simulated microcantilever with deformed position. (b) Side view of micro cantilevers (C) Face to face configuration of microcantilever.

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

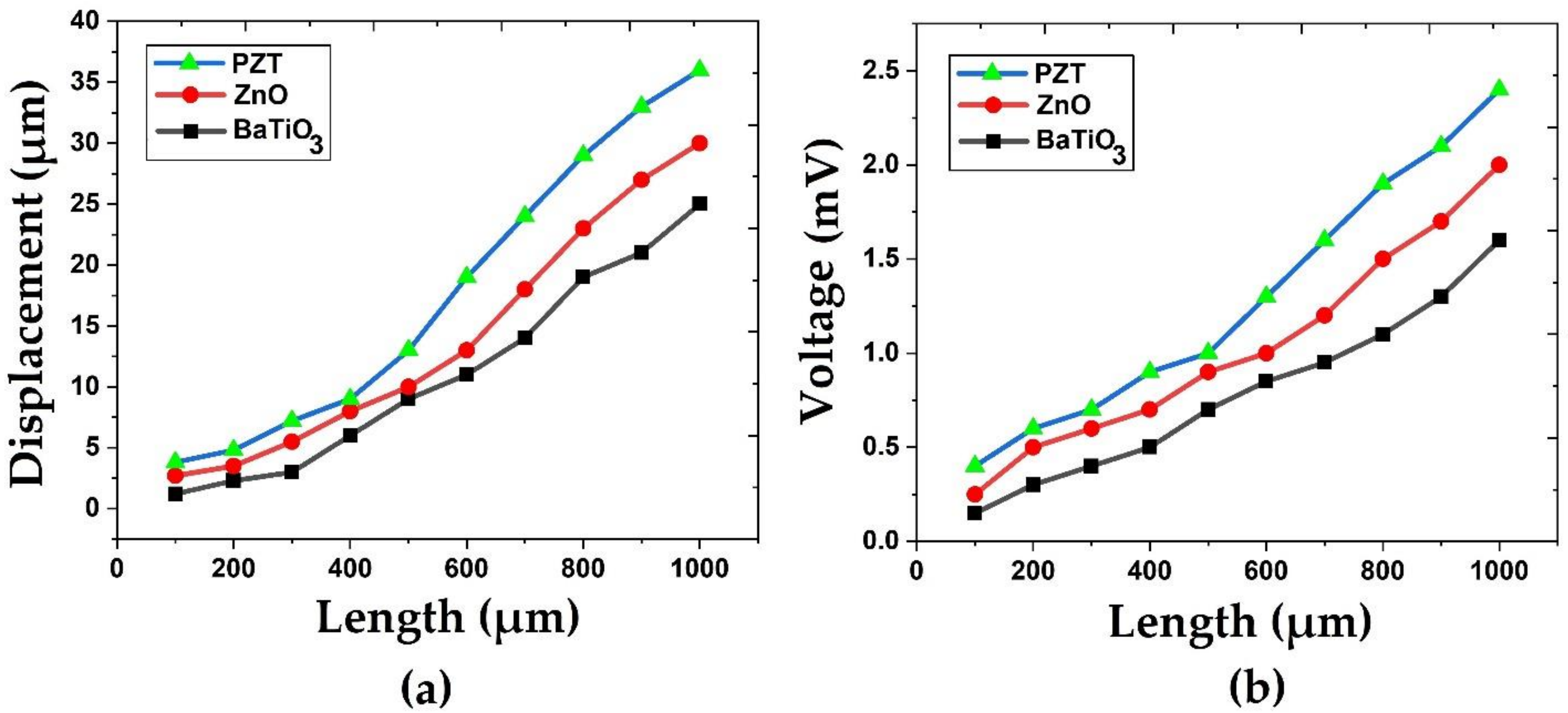


Figure 2. (a) Microcantilevers displacement vs Length with different piezoelectric materials (b) Microcantilever Voltage response vs Length with different piezoelectric materials