

# Design and Optimization of Cholesterol Biosensor

N. Meenakshi Sundaram, M. Alagappan, B. Vigneshwaran

Department of Biomedical Engineering, PSG College of Technology, Peelamedu, Coimbatore 641004

**Introduction:** Cantilever-based sensing is based on a deflection of the cantilever beam due to induced surface stress, added mass, or the transfer of heat. The enzyme (cholesterol oxidase) specific to the analyte (cholesterol) of interest are immobilized over the surface of the cantilever. When cholesterol are introduced on the surface of the cantilever, it firmly attach to the cholesterol oxidase which is pretreated on the cantilever. The cantilever bends due to the change in the surface stress which is caused by the change in mass of the cantilever.

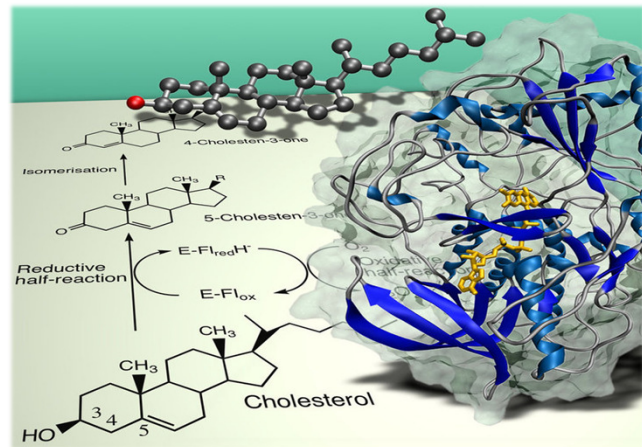


Figure 2 : Molecular recognition of cholesterol

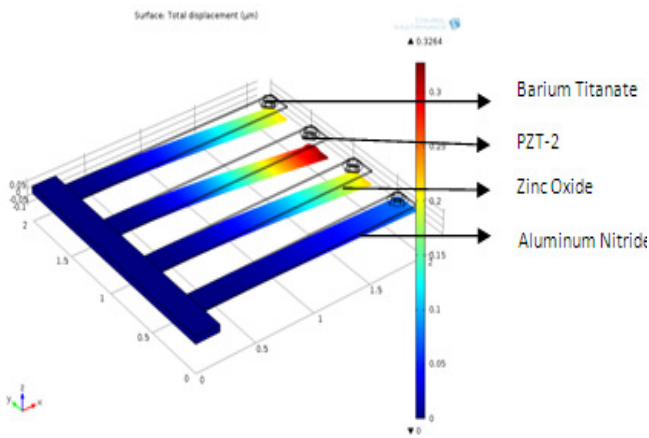


Figure 1: Displacement of Aluminum Nitride, Zinc Oxide, Lead Zirconate Titanate (PZT-2), Barium Titanate cantilever by 1 nN load

Table 1: Displacement and surface potential of PZT under 0.000003789 N load

Sample code	Lead Zirconate Titanate	Displacement (μm)	Potential (V)
1	PZT-2	4.5434	1.0305
2	PZT-4	4.4123	0.0816
3	PZT-4D	4.5969	4.3634
4	PZT-5A	5.5554	1.0845
5	PZT-5H	5.4066	0.1563
6	PZT-5J	5.8676	3.482
7	PZT-7A	3.9687	0.2592
8	PZT-8	4.2653	0.5789

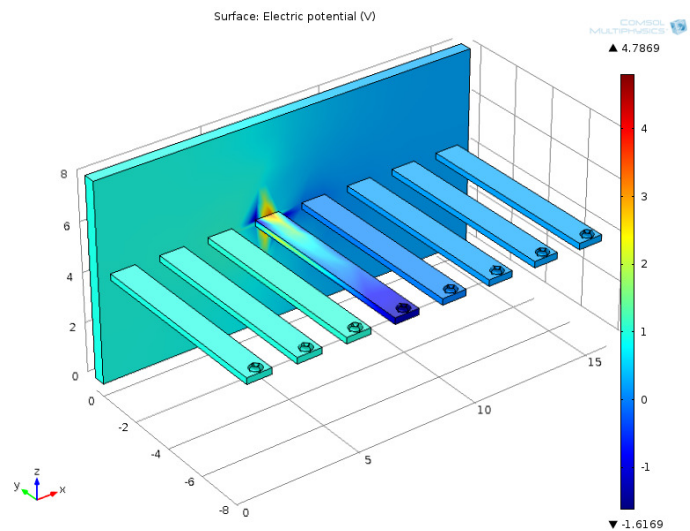


Figure 3: Surface potential of PZT-5A by 3.789 μN (Cantilever dimension : Length 8 μm, Width 1 μm, Thickness 250 nm)

**Conclusion:** This design and simulation of piezoelectric Lead Zirconate Titanates (PZT) micro-cantilever predicts that, PZT-5J have better displacement for good sensitivity of cholesterol and PZT-4D have superior surface potential.

## REFERENCE

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