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## Closed solid state nanopore array - A unique device for ultrasensitive label free impedance biosensors

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Various nanostructures like nanowires, nanotubes and nanopores have been extensively explored for label free conductance type biosensors and also for detection of a single molecule in synthesized solutions. However, their major limitation is that the detection limit of biomolecules in physiological fluids like blood is only in the range of few pM. There have been several attempts to push down the detection limit by performing the noise analysis of the conductance fluctuation. But it has failed to differentiate the noise originating due to the specific antibody-antigen binding kinetics from the large magnitude of the device noise for fM or sub fM concentrations. This talk explores the physical origin behind this phenomenon and introduces closed solid state nanopore array as a novel device for ultrasensitive detection. The device is fabricated by electrochemical etching of silicon followed by annealing treatment for coalescence of small pores below 10 nm diameter (usually formed on the top) and subsequent thermal oxidation. This ensures stable and reproducible impedance measurements. Experimental observations reveal the unique presence of resonant peak in the frequency dependent characteristics only in the presence of specific antigen. Further this peak is also concentration dependent and combining the noise analysis at the resonant frequency has enabled the selective detection of Hep-B virus in blood samples down to 1 fM concentration. The physics behind these observations have been interpreted by coupling finite element modeling of the solid and the fluid regions.

### Biography

Chirasree Roy Chaudhuri has completed her PhD in 2007 at Jadavpur University, India and is presently an Assistant Professor in Department of Electronics and Telecomm Engineering, IEST Shibpur, India. Her fields of research interest are "Development of selective electrical biosensors, understanding the physical mechanisms for sub-femtomolar detection and measurement of biophysical properties of cells through distributed models". She has received Young Scientist Award from National Academy of Science, India and Women Excellence Award from Department of Science and Technology, Government of India and has published around 60 papers in peer reviewed journals and proceedings.

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