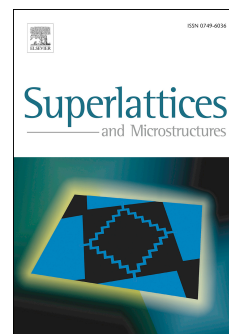


Accepted Manuscript

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PII: S0749-6036(17)30494-9

DOI: [10.1016/j.spmi.2017.05.035](https://doi.org/10.1016/j.spmi.2017.05.035)

Reference: YSPMI 5016

To appear in: *Superlattices and Microstructures*

Received Date: 27 February 2017

Accepted Date: 14 May 2017

Please cite this article as: P. Venkatesh, K. Nigam, S. Pandey, D. Sharma, P.N. Kondekar, A dielectrically modulated electrically doped tunnel FET for application of label free biosensor, *Superlattices and Microstructures* (2017), doi: 10.1016/j.spmi.2017.05.035.

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A Dielectrically Modulated Electrically Doped Tunnel FET for application of Label Free Biosensor

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Abstract

The fabrication challenges and cost of nanoscale devices have been a major concern in the field of label free biosensor. Therefore, to overcome these issues, we report for the first time a dielectrically modulated electrically doped tunnel field-effect transistor (DM-EDTFET) as a biosensor for label free detection. For this purpose, n^+ drain and p^+ source regions in proposed device are induced by considering polarity bias of PG-1 = +1.2 V and PG-2 = -1.2, respectively over the ultra-thin silicon body. The proposed structure is immune against doping control issues, avoids thermal budget and fabrication complexity as compared to its counterpart TFET. In DM-EDTFET, a nanogap cavity embedded within the gate dielectric is formed by etching the selected portion of gate dielectric layer towards the source side for sensing the biomolecules. The sensing ability of DM-EDTFET has been analysed in terms of variation in dielectric constant and charge density of biomolecules, and device geometry parameters at different bias conditions. To analyse the relative sensitivity, proposed DM-EDTFET is compared with MOSFET based biosensor in terms of sensing parameters. From these results, DM-EDTFET provides superior results in terms of sensitivity as compared to MOSFET based biosensor. Hence, the proposed DM-EDTFET biosensor can be a promising candidate for the development of future sensing bio-

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