



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : Monica Naorem

Roll Number : 166153101

Programme of Study : Ph.D.

Thesis Title: **SiO₂ Trench Embedded Field Effect Transistor for Biosensing Applications**

Name of Thesis Supervisor(s) : Prof. Roy Paily

Thesis Submitted to the Department/ Center : Centre for Nanotechnology

Date of completion of Thesis Viva-Voce Exam : 2nd June 2022

Key words for description of Thesis Work : Biosensor, Field Effect Transistor.

SHORT ABSTRACT

Bio-FETs couple a transistor device with a bio-sensitive layer that can specifically detect biomolecules. There are many challenges involved in a Bio-FET such as the selection of a suitable substrate and channel material, provision of a sensing film layer on the active site of FET, setting up a receptor on the sensing film layer to enable ion detection, the inclusion of liquid holding facility, etc. Moreover, rapid response and higher sensitivity are required for the sensor. The proposed structure has a SiO₂ trench along with a reservoir that removes the need for any extra mold for containing the analyte liquid. The inbuilt trench structure brings additional benefits such as ease in the analyte pouring during the sensing, helps in the storage of liquid, minimizes the overflow of the analyte liquid and improves gate control by an increment in effective oxide capacitance. The device was fabricated using photolithography followed by etching steps. A basic trench embedded FET device was electrically characterized with KCl as an ionic liquid channel. Using the fabricated device, H₂O₂ was sensed using GO/PPy nanocomposites as the channel, and glucose & LDH were sensed using GO/Ag NPs. This FET device can detect the occurrence of a chemical reaction in real-time.