



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : Balakumara Vignesh M

Roll Number : 186107106

Programme of Study : Ph.D.

Thesis Title: **Multiparametric Water Quality Sensor: Characterization, Calibration, and Calibration Transfer**

Name of Thesis Supervisor(s) : **Prof. Senthilmurugan Subbiah, Dr. Bérengère Lebental**

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SHORT ABSTRACT

This thesis focuses on developing a multiparametric water quality sensor using Carbon Nanotubes (CNT)-based ink to measure parameters like active chlorine and pH, along with sensors to measure conductivity, and temperature. Developed under the Indo-EU Horizon 2020 project LOTUS, the sensor integrates a CNT ink-based head, an Analog Front End (AFE), and communication for real-time monitoring. A bypass structure protects the sensor from suspended solids and ensures controlled water flow, facilitating easy maintenance and installation. The sensor was tested across various scales, from lab experiments to water loops, leading to the development of a plastic version to meet the Indian market's needs (affordability, reliability and longevity). However, we faced challenges in ink deposition and delay in sensor desorption, causing performance issues. Nonetheless, the preliminary results suggest the sensor's potential for affordable, real-time and continuous monitoring in field conditions, with lifecycle testing indicating sustained functionality for over five months. Future efforts will focus on enhancing fabrication processes and developing robust models to address these challenges. Overall, this thesis successfully developed and designed an optimized framework and a lab-tested prototype for a low-cost multiparametric water quality sensor tailored for the Indian market.