INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : **Ph.D.**

Thesis Title:
Engineered Metallic Dendrites and Their Nano-composites for Electrochemical Biosensing Applications

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SHORT ABSTRACT

Biosensors are continuously being improved to achieve higher sensitivity and selectivity with the incorporation of novel signal amplification strategies and nanomaterials. In this work, metallic dendrites and its nano-composites have been used in the sensing matrices for immobilization of biorecognition elements as well as to achieve enhanced electrochemical property, larger surface area, high catalytic activity, and anti-fouling property. Based on this, four different electrochemical sensor systems have been developed to detect molecules of clinical importance. In the first work, a non-enzymatic biosensor has been designed for the ultrafast and label-free detection of hydrogen peroxide (H_2O_2), a molecule associated with various pathological conditions, based on a sputtered Indium tin oxide electrode comprising gold nano hierarchical 3D dendrites. In the second and third work, two different sensing systems i.e. a gold-copper (Au-Cu) bimetallic dendritic matrix, and a nanohybrid comprising of multi-walled carbon nanotubes-gold nanoparticles-gold nanodendrite have been developed for the detection of acetaminophen in human urine samples, a commonly used antipyretic and analgesic drug associated with hepatotoxicity. In the fourth work, an electrochemical immunosensor has been developed using a composite of Au nanodendrite, reduced graphene oxide, and chitosan for the detection of Carcinoembryonic antigen (CEA), a well-known cancer biomarker found in serum. All the nanodendrites are engineered to achieve maximum current responses and catalytic activity to detect the analytes in biological samples, which can be further utilized for the development of miniaturized hand-held portable devices for onsite diagnosis.