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Notice Board

Cordially invites you to the

INSTITUTE COLLOQUIUM

(Division of Interdisciplinary Research)

by

Professor Navakanta Bhat

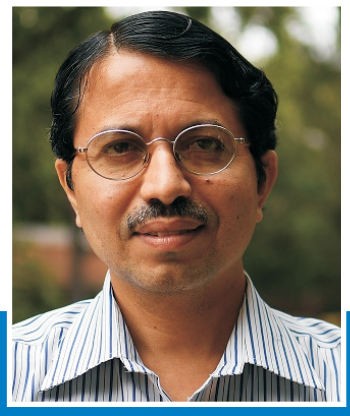
Chairperson

Centre for Nano Science & Engineering

(CeNSE)

INDIAN INSTITUTE OF SCIENCE

BANGALORE



Professor Navakanta Bhat

"PathShodh : A Journey from Science to Product"

ABSTRACT

In this talk, I will describe our fascinating journey in the last few years, traversing through scientific discovery, engineering innovation, entrepreneurial venture and manufacturing scale-up to create one of its kind multi-analyte point of care diagnostic device for diabetes and its complications. The device is currently capable of performing 5 blood tests (Hb, HbA1c, Serum Albumin, Glycated Albumin, Glucose) and 3 urine tests (Microalbuminuria, Urine Creatinine and Urine ACR), using electrochemical bio-sensing technology (www.pathshodh.com). Based on my experience, I will also discuss the challenges involved in translating the scientific discovery into product to create societal impact.

According to IUPAC definition, Biosensor is a self-contained receptor-transducer device, unlike a bio-analytical system in pathology labs. The "receptor" should be selective to a specific biomolecule and robust against variations in ambient conditions (humidity, temperatureetc). There has been a lot of emphasis in using enzymes and antibodies as receptors. While they are extremely selective, their stability is less than satisfactory for point of care diagnostic applications. Despite the large number of publications in Biosensors literature, the practical deployment has alarmingly lagged behind. Several critical reviews have stressed the need to invent new receptors to fast track the deployment of Biosensors (ex: "Probes, Sensors, and Labels: Why is Real Progress Slow?" Angew. Chem. Int. Ed. 2013, 52, 9864 – 9865). We explore novel receptors, based on chemical ligands and metal ions, which are highly stable, as opposed to enzymes and antibodies. The identification of the receptors is based on careful analysis of the journey of a given biomolecule inside the human body from its synthesis to degradation. For instance, the electrochemical detection of albumin has been elusive, since there is no redox active metal centre in its structure. albumin, an abundant plasma protein, is also called as "molecular taxi" in the human body. It can bind to variety of substances including fatty acids, drugs, metal ions etc. We note that albumin has the highest binding affinity with Copper with an association constant of 1.6x1016 M-1. By embedding dry copper chemistry using copper salts, we demonstrate highly reliable and robust electrochemical detection technique for serum albumin.

The handheld device (reader) consists of a generic four channel potentiostat platform, capable of performing simultaneous measurements on 4 electrochemical cells. In addition, the device includes several smart features such as test strip detection, sample detection, noise cancellation, humidity and temperature compensation, touch screen display, Bluetooth connectivity. The handheld device is qualified for the IEC standards.We also develop an unique design for screen printed electrodes, with a capability of customizing the disposable test strips for a specific biomolecule. The innovations in equipment set and process flow will be described for automating the conversion of screen printed electrodes into test strips. The issues in scaling up the production to meet the stringent requirements of medical diagnostics will also be presented.

Friday, 20 January 2017 | 4-00 p.m. | Faculty Hall

Professor Anurag Kumar, Director

will preside

Tea : 5-00 p.m.

All are Welcome