Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number

2023-01-30

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details	
Project Title	Microfluidic chip based point of care analyzers
Project Summary (Minimum 500 and maximum 2000 characters)	The requirement of point of care system for rapid but accurate detection of bioanalytes from diverse samples such as sputum, saliva and blood require careful integration of various components in a Lab-on-a-chip architecture. This requires thorough understanding of microfluidics, design of microchip, hardware integration (as commercial hardware may not be miniaturized or suit the new architecture), software for data processing and signal conditioning and finally clinical validation of system on real samples. As an example, detection of non-small cell lung carcinoma (NSCLC) at early stage is clinically extremely important. A number of protein-based biomarkers such as CEA, CYFRA-21-2, EGFR, SFTBP-57 are detected in blood sample but their concentration is extremely low. Sputum that is a direct sample from lungs contains exfoliate epithelial cells and liquid and thus likely to have relatively higher concentration of biomarkers compared to blood samples. Therefore, detection of NSCLC would require cell lysis, removal of interferants, binding of biomarker on chip followed by automated washings and finally impedance or optical detection. Therefore, the project is hugely multidisciplinary and requires candidate to have good hands-on training beforehand in a few of the domains of research if not all.

PhD Supervisors

Role	Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Prof. Sandeep K Jha	CBME	sandeepjha@iitd.ac.in
Supervisor 2	Prof. Prashant Mishra	DBEB	pmishra@dbeb.iitd.ac.in

Project requirements (Student qualifications, experience required, etc)

- Background in electrical Engineering/ Physics / microfabrication and also having significant knowledge in biochemistry/Biotechnology / immobilization / antibody stabilization
- Candidate shall be trained in microfabrication, electronic circuit development and assembly of hardware if not already versed

Source of fellowship/funding
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Candidate with his/her own fellowship

Role of Faculty Members involved:

Sandeep K. Jha: (1) diagnostic lab-on-a-chip development using photolithographic processes (2) design and development of hardware and signal processing algorithm for the POCT device (3) limited clinical validation of product at final stages of project

Prashant Mishra: (1) Preparation of magnetic antibody for the capture of biomarkers (2) Study of presence of biomarker in human cell lines (3) Detection of presence of biomarkers in Tissue microarray