



Project Proposal for Ph.D.

Project Details	
Project Title	Tracking protein dynamics in cells through optical and spectroscopic techniques
Project Summary (Minimum 500 and maximum 2000 characters)	Real-time imaging of biomolecules inside cells presents an everlasting challenge in unraveling the mysteries of biology. However, tagging a specific probe orthogonally to a particular protein and turning them on in a specified context has been challenging. There is an unmet need to match the desired imaging standards to replace molecular probes. Moreover, the current methods rely mainly on the ability of these <i>active probes</i> to study them in vitro but not within the cell. In this light, we propose developing novel <i>pro-probes</i> that can be converted into active probes only in the given context by tagging them to a particular protein of interest. In this project we will be designing probing agent that will remain non-luminescent when the tagged protein remains soluble and monomeric while it is expected to become active only after forming clusters or multimers within the cells, it could be the first of its kind as an effective and noiseless imaging method. On top, we will try to use the same probe to check the contribution from the phase separation events by disrupting the liquid-liquid phase separated (LLPS) molecules.

Ph.D. Supervisors			
Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Soumik Siddhanta	Chemistry, IIT Delhi	soumik@chemistry.iitd.ac.in
Supervisor 2	Karthigeyan Dhanasekaran	Regional Centre for Biotechnology, Faridabad	karthigeyan@rcb.res.in

Project requirements (Student qualifications, experience required, etc) *The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)
- M Tech/ MSc in Chemistry/ Analytical Chemistry/ Biochemistry/Biomedical engineering (Prior experience in spectroscopy/optical instrumentation or machine learning will be appreciated) - Other criteria as per the SIRe requirements

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 /institute assistantship

Role of Faculty Members involved:	
Supervisor-1	Dr. Siddhanta’s research has led to multiple collaborative projects on biomedical and

	pharmaceutical applications of fluorescence, Raman, surface-enhanced Raman spectroscopy and other analytical techniques. The optical probes will be fabricated in Dr. Siddhanta's lab and will be extensively characterized.
Supervisor-2	Dr. Karthigeyan's research group works on cancer and viral disease cell biology and their therapeutic intervention strategies. However, understanding the fundamental biophysical properties that could be tapped in the formulation of small molecules targeting the centrosomal pool of viral proteins is lacking, and the same can be explored with the methodology developed in our proposal based on the imaging probes to be developed in Dr. Siddhanta's lab.