

Indian Science Technology and Engineering facilities Map (I-STEM)

Invites application for

1. **Partial financial support for using R&D facilities in other institutions through the I-STEM web portal to Users from Academic Institutions and Start-ups (Format-1)**

Format for requesting support for accessing and using facilities through the I-STEM web portal.

(i) Details of the Personal Information

- a. Name of the Researcher: PRAKASHA G S
- b. Name of the Institution: GLOBAL ACADEMY OF TECHNOLOGY
- c. Name of the Department: PHYSICS
- d. Degree registered for:
- e. Contact: 9844996853

(ii) Project/Research topic Details:

- a. Project Title/Research Title: fabrication and characterization of ZnO/SnS-based sensors and solar cells.

Generic Title:

- b. Subarea: Condensed Matter Physics.
- c. Area Description: solar cells and sensors
- d. Aims & Objective:
 - (i) Synthesis of ZnO and SnS thin films by chemical methods
 - (ii) Optimize the properties of chemically synthesised films towards fabrication of high efficiency solar cells and ultra-sensitive sensors
- e. Duration (MM/YYYY):
- f. Project Summary:

Our goal is to investigate how thickness, doping, precursor concentration, and temperature affect the properties of solution-processed ZnO/SnS-based solar cells, including open-circuit voltage, saturation current density, fill factor, and efficiency, as well as sensor properties, including sensitivity, selectivity, speed, and stability of thin films. The present work will prove that the chemical techniques such as spray pyrolysis and solgel spin coating are viable for fabrication of highly efficient solar cells and sensitive sensors.

a. Technical Details

- a. TRL: NIL
- b. Methodology:

ZnO and SnS thin films were prepared by homemade chemical techniques such as spray pyrolysis and solgel spin coating. Prepared film properties such as structural, morphological, compositional, optical, electrical, were optimized by varying thickness, concentration, and annealing. Metallization was done on the front and back of the substrate by sputtering and thermal evaporation. Fabricated solar cells properties such as open-circuit voltage, saturation current density, fill factor, and efficiency were investigated. Followed by study of sensitivity, selectivity, speed, and stability of sensors.

- c. Design & development:

- d. Facilities and Instrumentation required:
- 1) XRD (structure, crystal size, crystallinity, stacking fault)
 - 2) Ellipsometry (thickness, refractive index, extinction coefficient, dielectric constant)
 - 3) Optical-profilometer (Thickness, roughness)
 - 4) SEM and TEM (grain size)
 - 5) Auger spectroscopy (AES) (composition of various films in the device)
 - 6) UV-VIS-NIR Spectrometer (optical parameters, Bandgap)
 - 7) EDAX (Composition)
 - 8) FTIR and XPS (chemical bonding, oxidation states, band gap)
 - 9) AFM (grain size, roughness)
 - 10) RamanPL (bandgap, defects, stoichiometry)
 - 11) Ellipsometer (thickness, refractive index, optical band gap, extinction coefficient, attenuation coefficient)
 - 12) Four-point probe (resistivity, sheet resistance)
 - 13) Hall effect (n or p-type, electron or hole concentration, mobility)
 - 14) Thermal evaporation and RF Sputtering (Metallization)
 - 15) Agilent 4155C parameter analyzer and 4284 LCR meter (AC/DC characterization)
 - 16) Solar cell simulator (solar testing unit)
 - 17) Impedance Analyzer (C-V studies)
- e. Consumables (Scientific materials): Silver paste, n and p type Silicon wafers Si (100), ITO(10Ω / □ cm)

b. **Expected output and outcome:**

c. **Industry/Institute Collaboration**If, yes

- (i) Name of the Collaborating Industry/Institute
- (ii) Collaboration Details
- (iii) Additional Details if any

d. **Funding required from I-STEM (with justification:**

Sr. No	Particulars	Justification
1	Substrates (silicon, ITO)	As I do not have facilities at my institution and financial support from any funding agency, I am meeting all expenditure on my own, I require funding and also reimbursement from I-STEM for further studies.
2	Characterization (XRD,SEM,EDS,AFM,TEM, XPS, RAMAN, PL, ELIPSOMETRY,I-V, C-V, SOLAR SIMULATOR STUDIES, GAS SENSING STUDIES, SO ON	
3	Metallization (front metallization of Silver by R F Sputtering and back metallization of aluminum by thermal evaporation)	

Details of Requirements&Mode of the Engagement:(Attach the quotation for the consumables)

- (i) Short term Engagement:
 - a. Usage of testing/characterization facilities across the country (Characterization Mode)
 - i. Testing Charges:All characterization facilities available at CENSE, IISC.
Charges are not mentioned in website
 - ii. Consumable charges
 - iii. Travel Cost (Boarding and Lodging, if any)
 - b. Usage of fabrication and testing facilities across the country (Fabrication Mode)
 - i. Fabrication and testing Charges:All fabrication and testing facilities available at CENSE, IISC. Charges are not mentioned in website
 - ii. Consumable charges (if any)
 - iii. Travel Cost (Boarding and Lodging, if any)
- (ii) Medium term Engagement:
 - a. Execution of project in any one of the Host Institution (Project Mode)
 - a. Fabrication and or testing Charges
 - b. Consumable charges (if any)
 - c. Travel Cost (Boarding and Lodging, if any)
 - b. Execution of project in Multi Host Institutions (Project Mode)
 - a. Fabrication and or testing Charges
 - b. Consumable charges (if any)
 - c. Travel Cost (Boarding and Lodging, if any)

(Round-trip to the Host Institution by 2nd class (Non-AC) railway via the nearest route)

Details of User's Bank Account:UNION BANK OF INDIA

(Please send a copy of the cancelled cheque/copy of the passbook carrying all the information needed)

Beneficiary Name (User's name):PRAKASHA G S PAN:ARCPG1428K

Bank Account No:143510011000169 Name of the Branch:RR Nagar

IFSC Code:UBIN0814351

Note: Proposed proposal must be executed within stipulated duration (max. 6 month) to avoid fund availability issues. Travel form will be provided by the I-STEM office. The users will submit the technical report, original invoice (duly signed by the Head of the Institution) raised by the Host Institution through I-STEM portal only along with a copy of the travel forms and original tickets through post to the Nodal Officer, I-STEM, Indian Institute of Science, Bangalore. A scan copy of all the documents may be sent in advance.