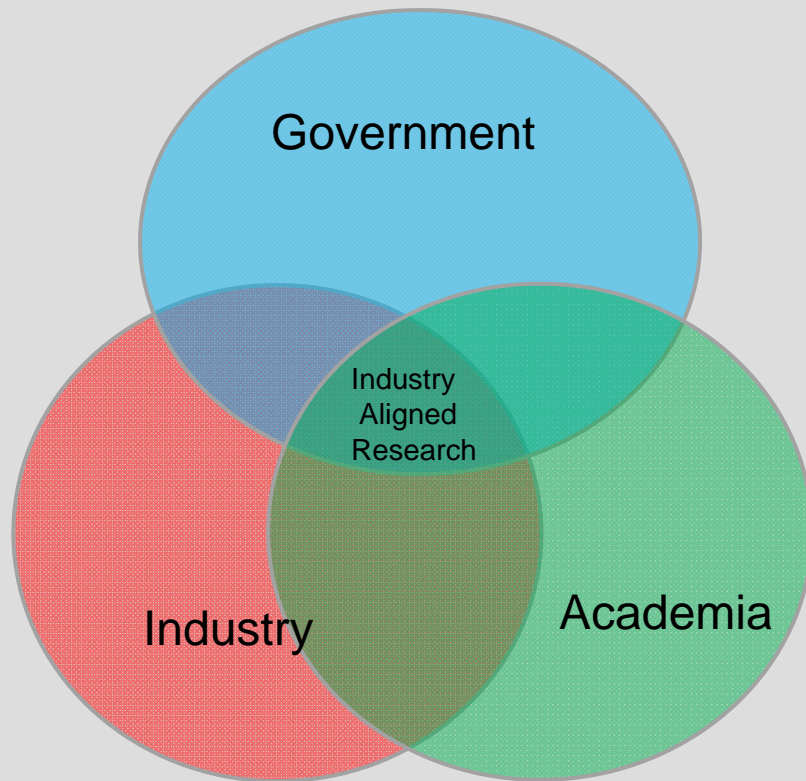


National Centre for Flexible Electronics



Indian Institute of Technology Kanpur

Tripartite Partnership



FlexE Centre - A platform for a meaningful interaction between industry and academia.

An interdisciplinary team that advances the frontiers of research in large area flexible electronics.

Synergistic interaction among industries engaged in product development, materials and equipment manufacturing.

The *centre* will identify national and international collaborators to accelerate project execution and sharpen project objectives by identifying partners with complementary strengths.

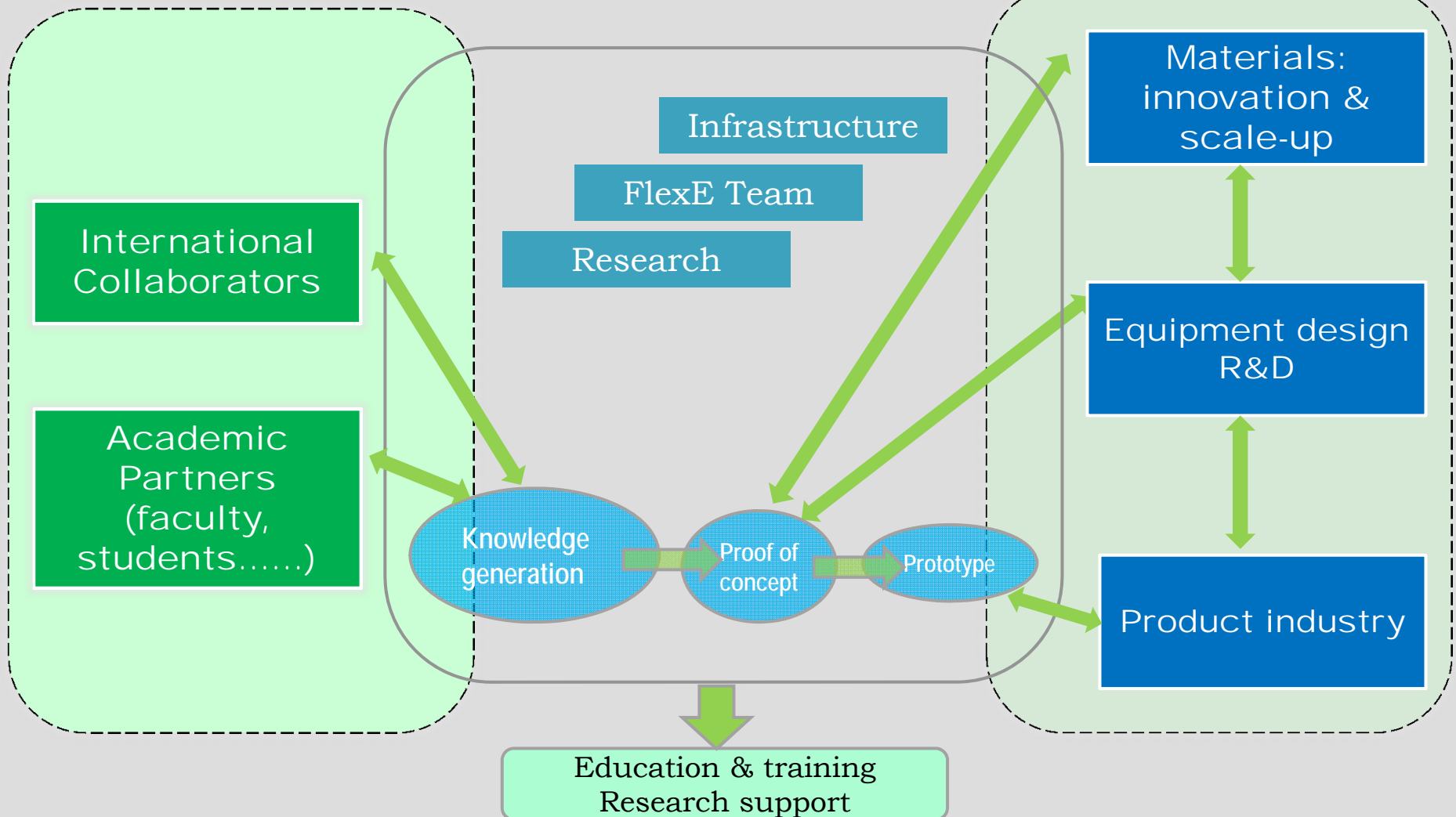
FlexE Centre and the partnering institution will define their collaborations in a projects proposal with well-defined deliverables and timelines for completing them.

FlexE Centre: Bridge between Academic and Industrial Ecosystem

Academic Ecosystem

FlexE Centre

Industrial Ecosystem



National Centre for Flexible Electronics



IIT
Kanpur

Vision and Objectives

Vision

Conduct research and development in large area flexible electronics that serves as a foundation for development of domestic industry in this field.

Objectives

R&D: Conduct basic studies and scientific investigations relevant to field of large area flexible electronics.

Manufacturing: Conduct research and development in large area flexible electronics by developing partnership with industry and with a view that potentially leads to manufacturing.

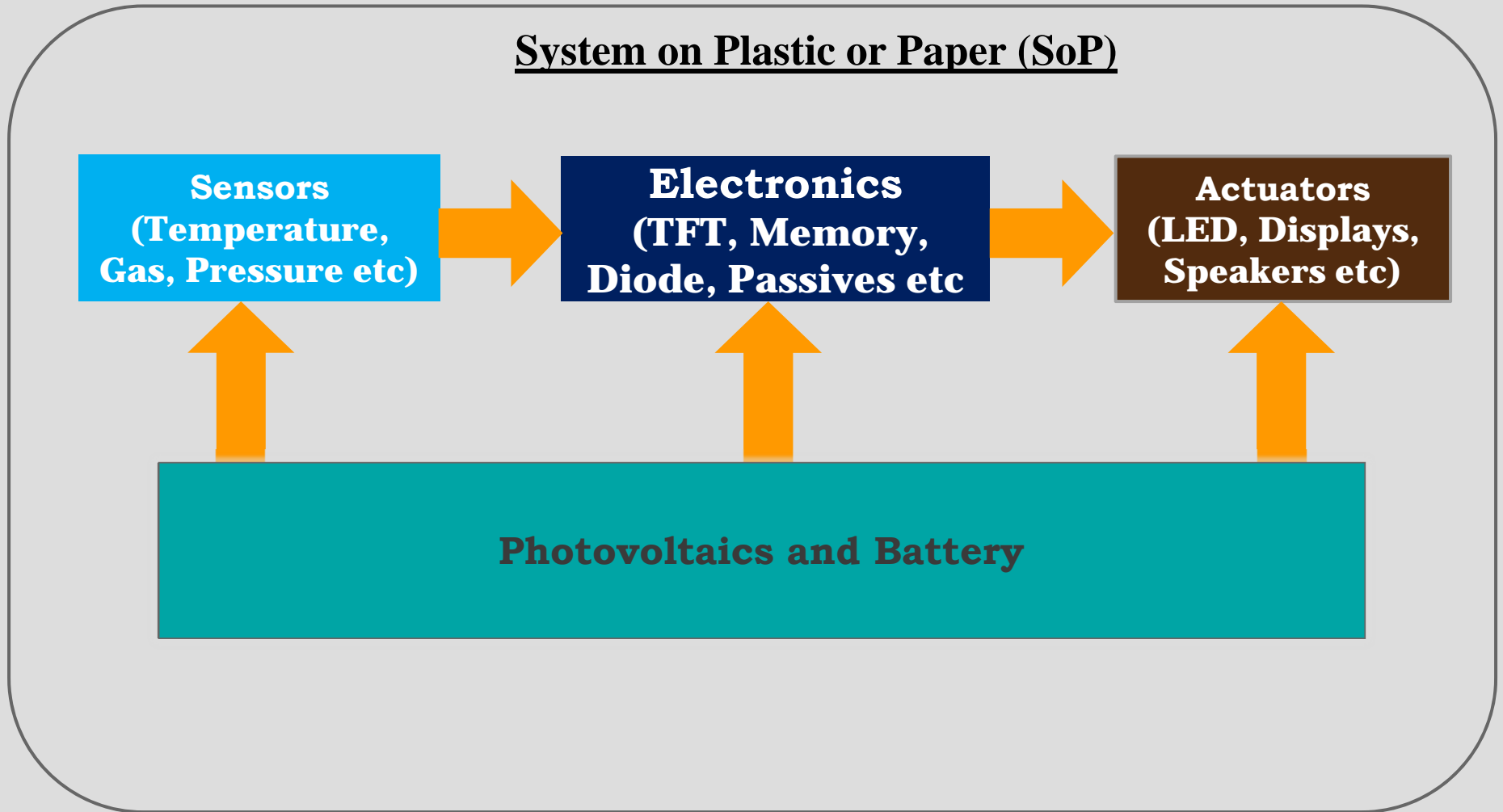
Ecosystems: Facilitate formation of industrial ecosystem by addressing various aspects, products, materials and machines and academic ecosystem by engaging with reputed centers internationally and individuals nationally.

Entrepreneurship: Incubate small scale industry related to flexible electronics

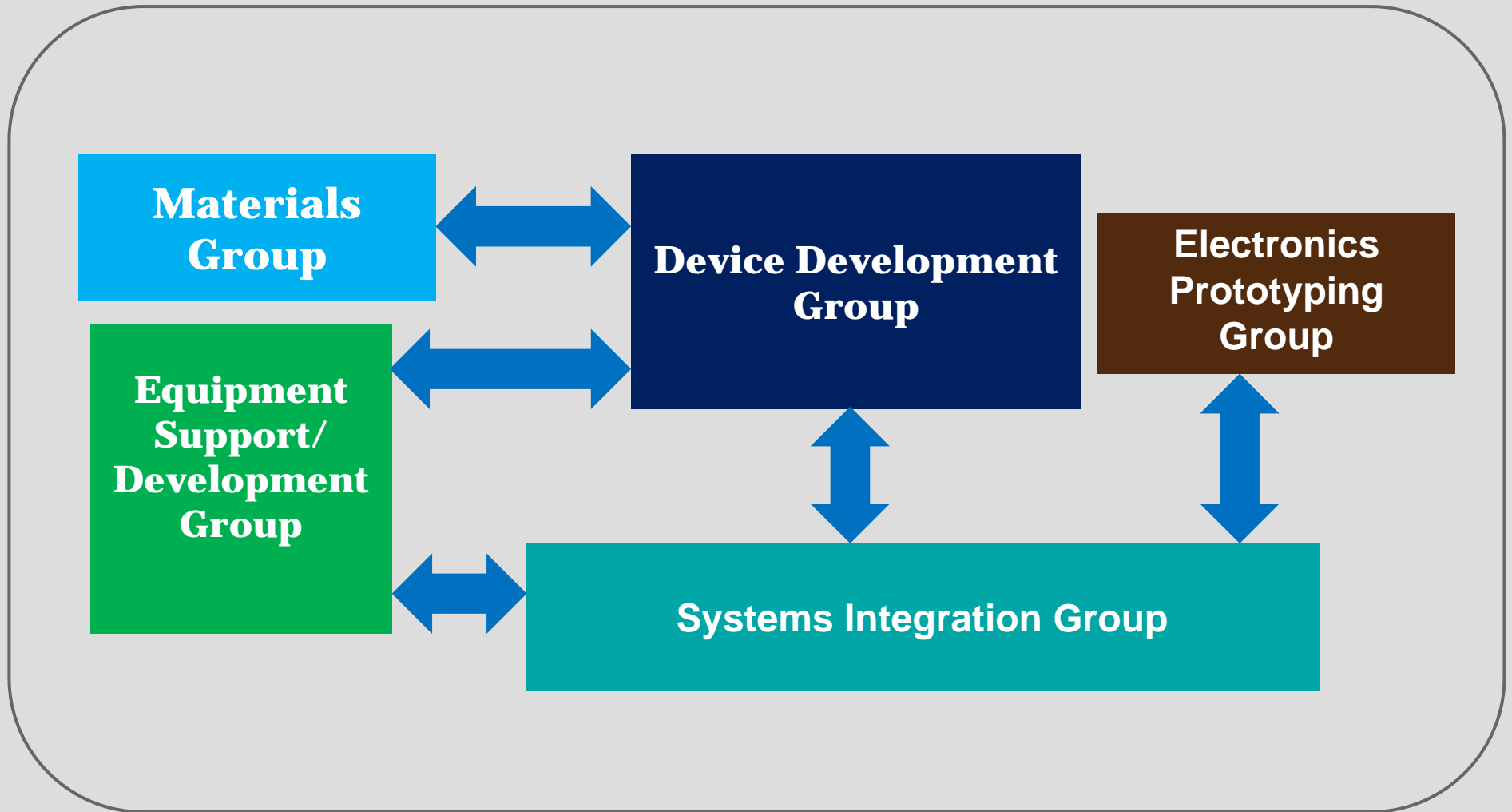
International Partnerships: Build strategic partnerships that hasten the development cycle.

Human Resources: Undertake human resource development in relevant area.

The Scientific Programme



Structure of FlexE Team



Technologies Available

OLED Lighting



OLED Display



Printable Electronics



Sensors

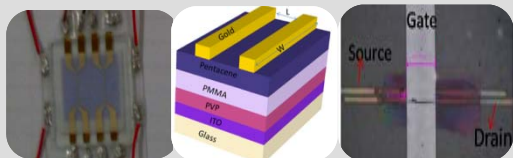


Core Expertise

Memory



Organic Transistors



Printed Inks



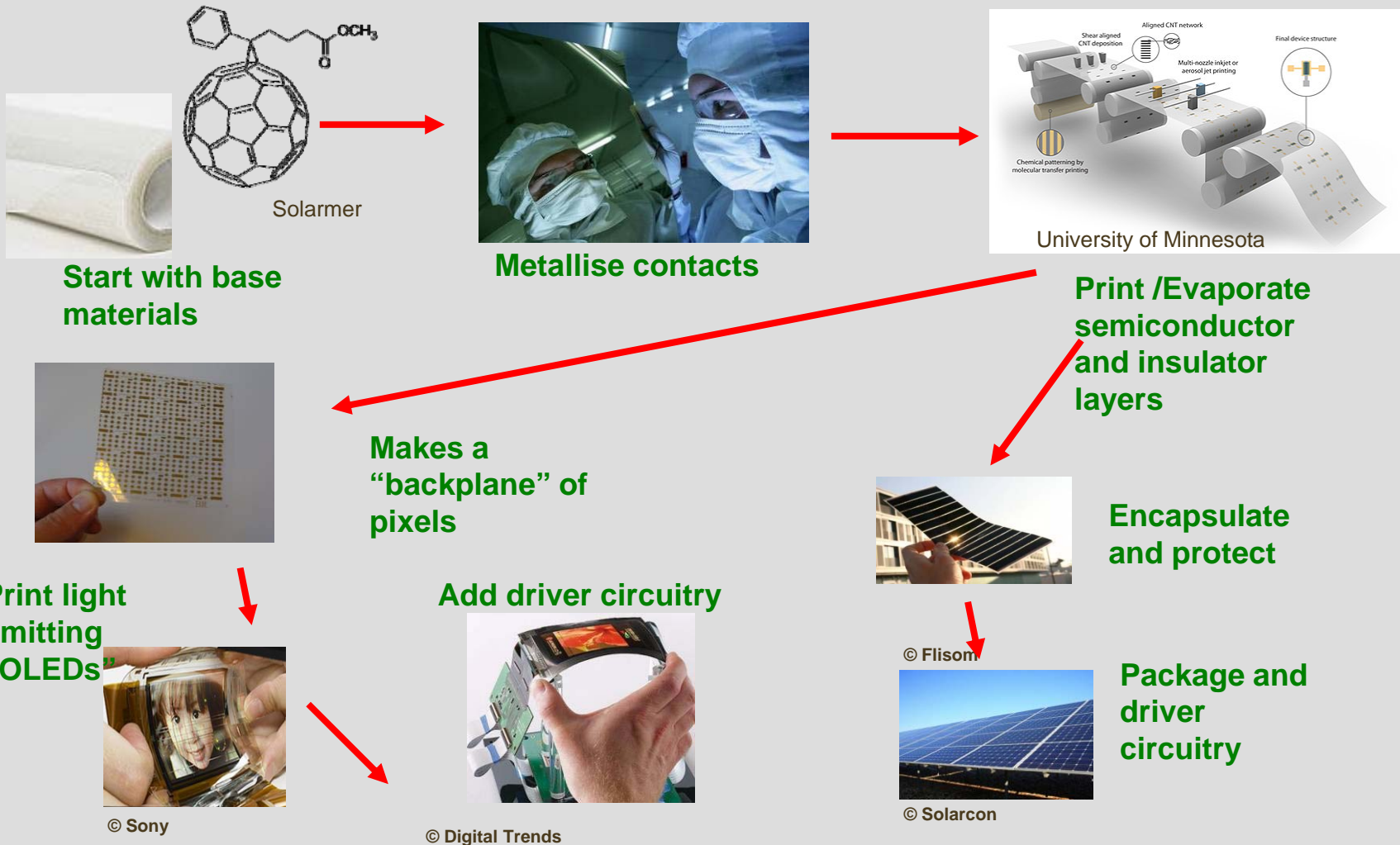
Organic Solar Cells



Potential Applications



Simple Manufacturing Process



Infrastructure and Facilities

Current Facilities

- **Over 500 m² Cleanroom** –
- With facility for wet processing, lithography and bio-material processing.
- **Processing Equipment** - Complete set of processing equipment including evaporators, sputtering, PECVD, RIE and DRIE for inorganic material processing
- **OLED/OPV Facility** - Integrated facility for fabrication of OLEDs for display and lighting and OPV modules by evaporation and spin coating.
- **Chemistry Lab** - A well equipped chemistry lab for synthesis of molecules, nanoparticles and inks for printing.
- **Characterization** - Wide range of in-house electrical, optical and structural characterization facility for thin films and devices.



Upcoming Facilities

A new clean room with State-of-the-art processing facilities

In addition to the above facilities a new building is being constructed to house following facilities:

- A 700 m² clean room and 500 m² non-clean lab space.
- Roll to Roll printing facilities (gravure, flexo, screen, slot-die etc.)
- Dryers (Flash, IR, thermal etc.) for printed films.
- Roll to Roll vacuum deposition facility.
- Process/material/device simulation laboratory.
- Monitoring and characterization facility for roll to roll printed thin films and devices.
- Device integration and prototyping.

New Building



National Centre for Flexible Electronics



**IIT
Kanpur**

Summary

- A World Class centre working at the frontiers of research in large area flexible electronics
- Industry aligned research with collaborative partnership with academia and industry
- Transform promising ideas into proof-of-concept devices
- Fabricate prototypes in collaboration with industry
- Participate in knowledge generation
- Spark invention by accelerating the process of trial-and error

Technology Commercialization



Conductive Inks

Current specifications

- Au & Ag based Inkjet printable conductive inks
- Viscosity range 3-10cP
- Resistivity $10^5 \Omega \text{ cm}$
- Processable temperature between 100-250°C(10- 30min)



Target applications

- Electrodes for various printed device applications like OPV, TFTs & Memory
- Any printed electronics circuit elements

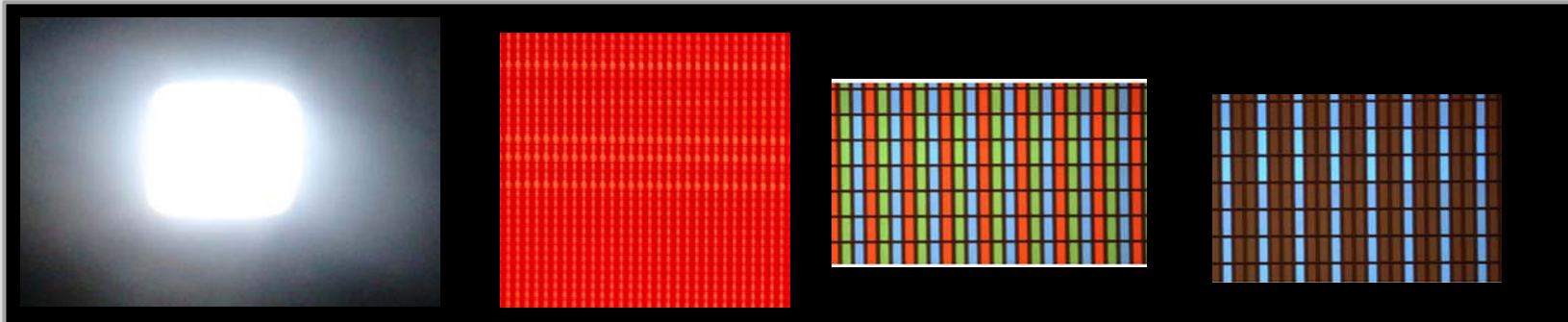


Capabilities

- Basic chemistry lab facility for synthesis
- Chemical characterisation tools
- Ink formulation & characterisation tools
- Printable ink tester for inkjet, gravure, flexography & screen printers

Patent portfolio: 1 patent applied

Solid State Lighting: OLED



- Large range of colours and design possible
- Flexible substrates

Current Capabilities

- Full fabrication facility for light panels of size 10 cm x 10 cm on rigid substrate

Future Expansion

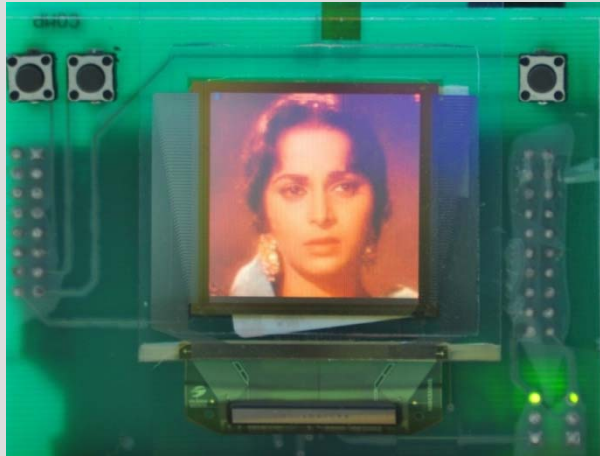
- Fabrication facility for roll-to-roll processing on flexible substrate

Patent portfolio: 4 patents applied

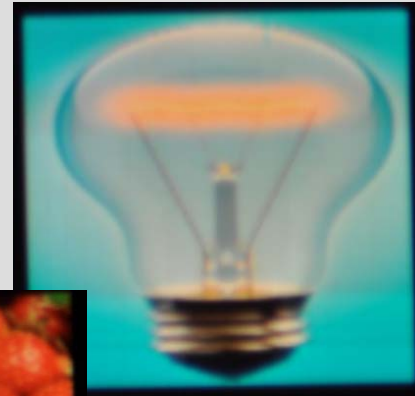
Target applications

- Strategic application:
 - light weight lighting source
- Urban application
 - Lamps and decorative panels
 - Furniture and building integrated lighting
 - Mood lighting

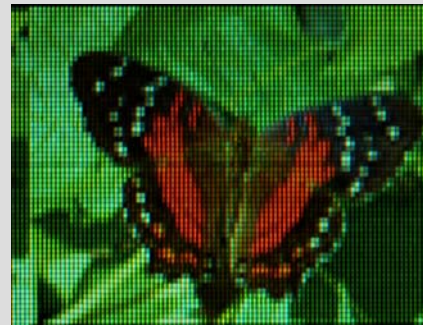
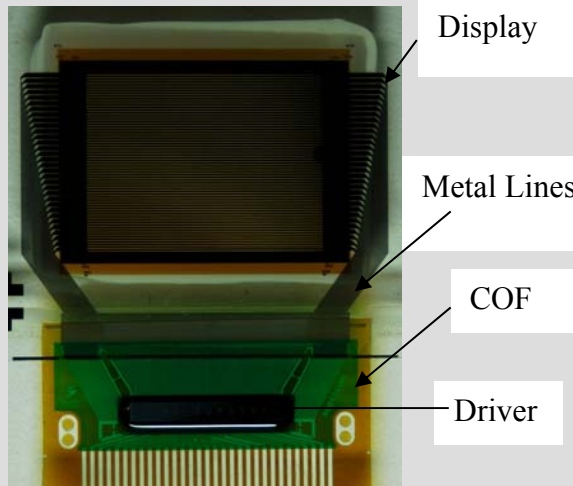
OLED DISPLAYS



Prototype



•1.5 inch diagonal, 128RGB x 128



Display module, full color 96 (3) x 64, 1", passive matrix, consisting of the OLED display, COF and driver.

Patent portfolio: 4 patents applied

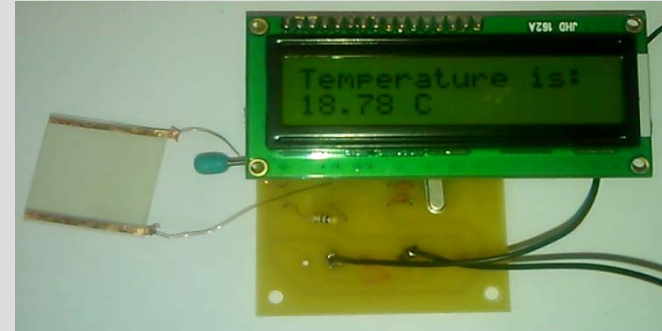
Sensors

Technology focus

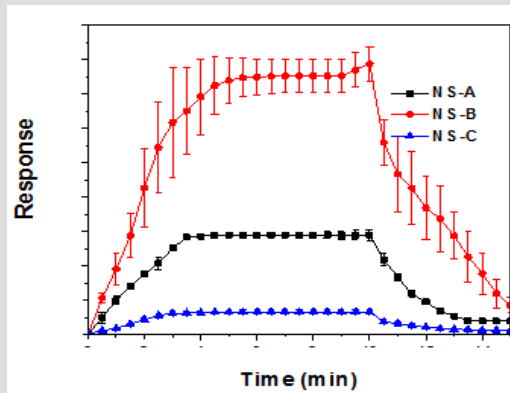
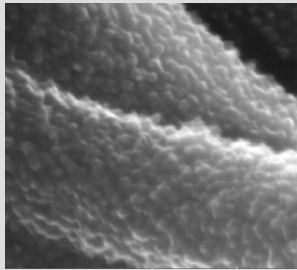
Sensor device design and fabrication
Sensor arrays, multianalyte detection

Application areas

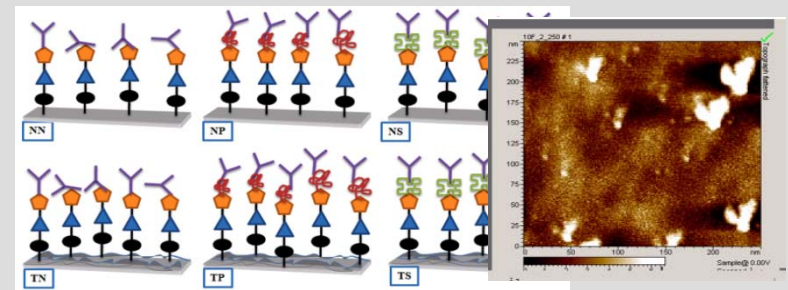
Healthcare, environmental, biomedical and food packaging, medical, process engineering, safety



Temperature



Gases



Disease diagnostics

Patent portfolio: 1 patent granted, 6 applications pending

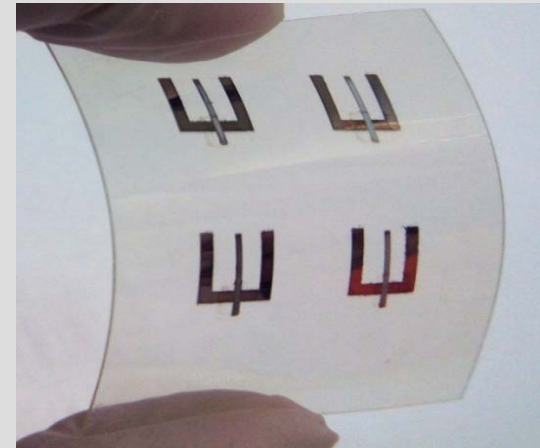
Low cost, printable electronics based tags

- Tags with printed electronic circuits for brand protection
- Smart tags incorporating memory and sensors

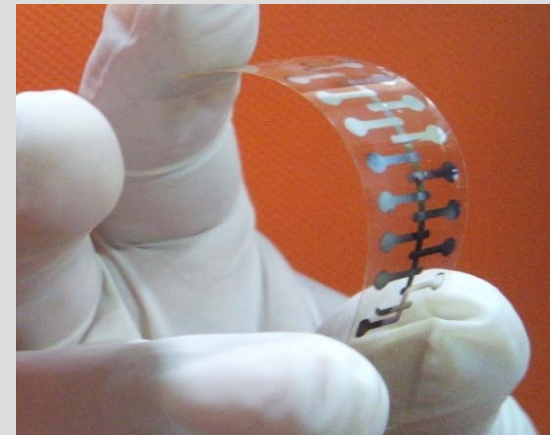
Target Applications

- Brand protection
- Tracking for goods
- Excise controls

Patent portfolio: 3 patents applied



Passive Tag



16-bit memory label

Organic Photovoltaic Sub-modules

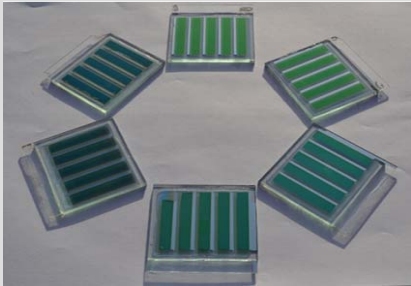
Current capability

On Glass Substrate

- Sub-modules of size 10 cm x 10 cm

On Steel Substrate

- Small area device 3 mm x 3 mm

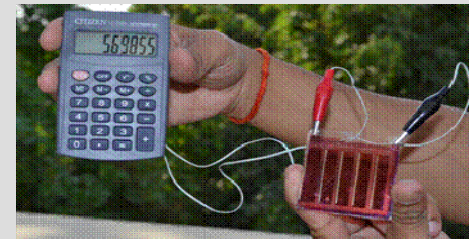
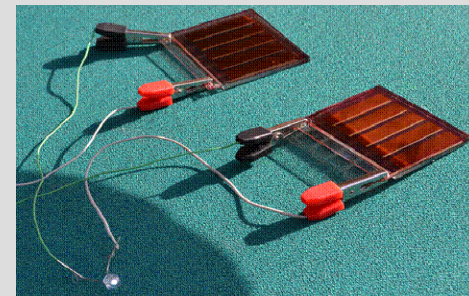


Working towards

- Sub-modules on steel substrate
- Sub-modules on paper & PET substrate
- High throughput printing process

Target applications

- Light weight power generation source
- Portable solar PV device on flexible substrate



Patent portfolio: 7 patents applied

Summary

FlexE Centre, IIT Kanpur is seeking academic and industry partners to further advance the frontiers of research in large area flexible electronics