

PhD Thesis Opportunity

Organic Solar Cells and Modules for Autonomous Powering of IoT Nodes in Urban Environments

Start Date: February/March 2026



Host Institution

Laboratory: ICube laboratory (<https://icube.unistra.fr/en/>)

University: University of Strasbourg

Supervisory Team

- Thesis Director: Dr. HDR Patrick Leveque
- Co-supervisor: Dr. Yaochen Lin

Contact for Applications and Inquiries

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Team EM3: Electronics, microelectronics and modelling for multidomain systems

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Team MATISEN: Materials for information technology, sensing and energy conversion

Project Overview

The large-scale deployment of connected sensors is a key component of smart cities, enabling real-time monitoring of environmental parameters such as air quality, noise levels, and traffic. However, providing a sustainable energy supply for dense sensor networks remains a major technological challenge. Current solutions rely predominantly on batteries or wired power supplies, leading to high installation and maintenance costs as well as a significant environmental impact due to electronic waste.

The EMPOWER#IoT project addresses this challenge by developing autonomous IoT sensors powered by emerging photovoltaic technologies capable of operating under realistic urban lighting conditions, including low light intensity, artificial illumination, modified spectra, and partial shading. In this context, organic photovoltaic (OPV) technologies are particularly promising due to their lightweight nature, mechanical flexibility, low-temperature processing, and excellent performance under low-irradiance conditions.

This PhD project focuses on the development of organic solar cells and modules specifically tailored to the energy requirements of autonomous IoT sensors. The work will bridge fundamental OPV device physics with system-level constraints imposed by real-world urban deployment.

Research Objectives

The main objectives of this PhD project are:

- To investigate the influence of illumination spectrum, intensity, and angle of incidence on the performance of organic photovoltaic devices.
- To adapt and optimize OPV device architectures to real urban operating conditions, in order to meet the voltage and current requirements for the electronic interface of IoT nodes.
- To develop organic photovoltaic modules using scalable and robust interconnection strategies.
- To assess the stability and durability of OPV cells and modules under conditions representative of urban environments.

Key Research Areas

- Organic photovoltaics (OPV)
- Organic semiconductor devices
- Module integration and upscaling

Research Network and Funding

This PhD is part of the trinational EMPOWER#IoT project (Interreg), involving academic, industrial, and public partners from France, Germany, and Switzerland. The position is fully funded by the European Regional Development Fund (ERDF), with additional regional and national co-financing. The doctoral candidate will benefit from a strong transnational research network and access to shared facilities and real-world IoT deployment scenarios.

Candidate Profile

Applicants must hold a Master's degree (or equivalent) in physics, materials science, chemistry, or a related field prior to the start date. A strong motivation in photovoltaic devices, organic semiconductors, and experimental research is required. Prior experience in organic electronics, thin-film device fabrication, or optoelectronic characterization will be considered an asset. Candidates should demonstrate good communication skills in English (French is an advantage) and the ability to work in an interdisciplinary and international research environment.

Application Procedure

Applicants should submit the following documents by email:

- Curriculum Vitae
- Motivation letter
- Academic transcripts (Bachelor's and Master's degrees)
- Contact details of one or two referees