



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

ELECTRONICS AND PHOTONIC MATERIALS

Novel materials for electronics and photonics are fundamental for progress in Information and Communication Technologies as well as Energy-transport and storage.

The researchers of the University of Bologna cover the whole chain of research and development necessary to establish novel electronic and photonic materials.

Research activities cover the synthesis of novel active materials, processing of materials and deposition, characterization, integration and simulation as well as application design:

- Development and characterization of thin film transistors for applications in flexible and printed electronics: AC and DC electric characterization, local nano-electronic characterization, mechanical stability, optoelectronic properties, modelling
- Design and development of flexible ionizing radiation detectors based on novel organic and inorganic semiconducting materials and thin-film devices. Study of the direct response and radiation hardness under X-ray, proton and gamma-ray radiation
- Si-based and perovskites thin films for photovoltaic applications. Electronic structure and defect studies by photovoltage spectroscopy, conductive force atomic microscopy
- III-Nitrides alloys and heterostructures for high-frequency electronics. The role of the defects on device properties by photocurrent and photovoltage spectroscopy, deep-level transient spectroscopy, Kelvin-probe microscopy
- Titanium oxide based photoelectrochemical devices: fabrication, doping, nanostructures and characterization
- Inorganic, carbonaceous and polymeric nanostructured electrode materials for electrochemical sensing and energy storage
- Synthesis and characterization of photochromic polymers for smart sensors
- Materials for textile electronics: integrated biosensors based on conducting polymers
- Organic semiconductors: simulation of structure and properties, experimental characterization
- Optical guiding structures: optical fibers and integrated waveguides(...) simulation and experimental characterization
- Materials for soft electronic actuators and electromechanic transducers

HIGHLIGHTS

- **Large-area flexible photonic sensor systems:** investigation of novel semiconducting thin films (organic, amorphous oxides, perovskites) for UV-vis, X-ray and γ -ray detectors
- **Ageing and diagnostics of insulator materials:** polymeric materials failure under high AC and DC voltage, charge accumulation and conduction mechanism
- **Organic-inorganic conjugates for augmented photonics:** design of organic chromophores to tune optoelectronic properties for applications as luminescent probes or light harvesting antenna