Ion **I**mplantation for **I**nnovative **I**nterface modifications in **BA**ttery and **G**raphene-enabled **S**ystems

Project start:
01.10.2022

Project Acronym:

I4BAGS

M-era.Net

Call 2021

Partners:

Łukasiewicz Institute of Microelectronics and Photonics

PNED

MATERIA NOVA

ionics surface technologies

The **I4BAGS** project aims to develop innovative processing and characterisation solutions for higher performances in microelectronics and battery applications. This implies monitoring of materials and interface properties of **graphene-on-SiC** Hall effect sensors and vertical rectifiers, and of thin-film solid batteries.

Objectives: Planned processing encompasses low-energy ion implantation tailored for targeted application. Broad frequency range characterisation methods from DC to millimetre waves supported by suitable modelling and software contribute to describe electrical properties of materials, structures, interfaces and devices. Generated data are to be collected within open innovation environment and disseminated throughout European Materials Communities.

Potential applications: Expected implementation includes electric transportation, smart metering, power applications and electricity storage solutions. Impact and potential benefits: The project is supported by private stakeholders to promote transfer of innovation to European industries.

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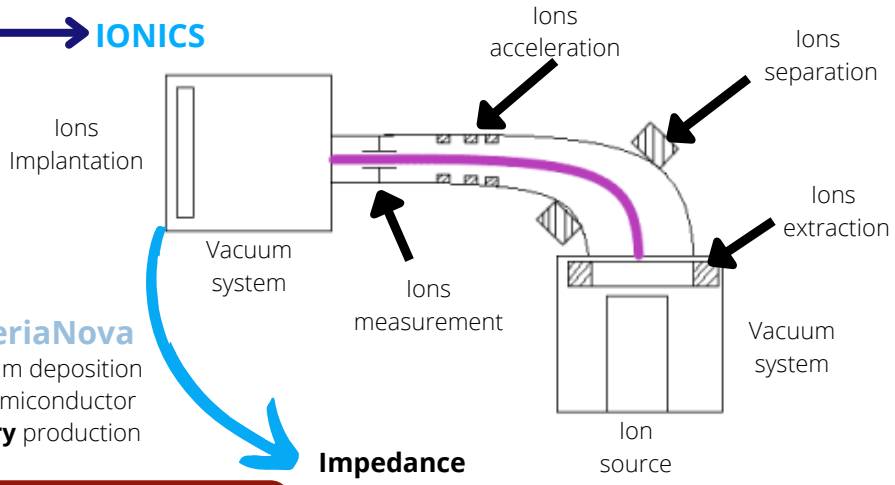
I4BAGS

low–energy (**keV**)
ion implantation (**LEII**)

COLABORATION

Schematic summarizing role of the partners, some of their tasks, their foreseen interactions in the transnational cooperation along with their respective contributions to the impact.

Simplified diagram of the **ion implanter**

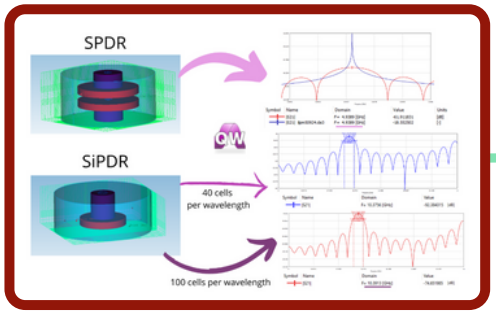


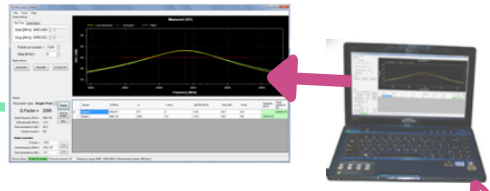
IONICS

MateriaNova
Thin film deposition for semiconductor **battery** production

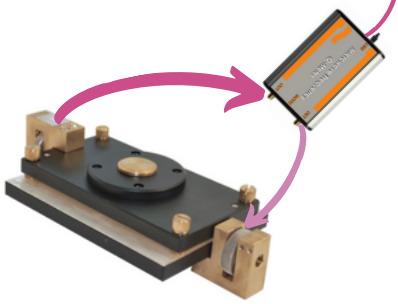
Impedance spectroscopy

Multi-physics modeling





QWED
Electromagnetic characteristics in the **mm - GHz** range of thin films and ion-implanted interfaces



Tests of **EM** properties

Łukasiewicz Institute of Microelectronics and Photonics

Epitaxy of graphene, homoepitaxy of **SiC** Delivery of flake graphene for Solid Electrolyte interphase (**SEI**) functionalization at the anode thin film solid state structures for post Li-ion battery applications (**TFSSB)**

Goals:

- an order of magnitude increase in the ionic conductivity of polymer electrolytes; **25%** increase in battery capacity / **100%** stability of cycling performance with implanted graphite cathode/functionalized anode technology,
- increase in **resistivity** of implanted **SiC** substrates and modification of near-surface layer properties, for increasing the temperature range of Hall sensors stability and optimizing diode structures in epitaxial graphene technology.
- Validation of new characterisation and modelling technologies in relevant environments and development of demonstrators for the dissemination and outreach purposes.

NCBR National Centre for Research and Development

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