

SUSTAINABLE MATERIALS, PROCESSES AND SYSTEMS FOR ENERGY TRANSITION

2D-3D nano-heterostructures for energy conversion and storage

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584]
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Context of the research activity	Development of high surface area nanostructured materials based on heterostructures of layered materials for electro- and photoelectro-chemical energy conversion and storage, e.g. solar fuels and electrochemical supercapacitors.
Objectives	<p>Scholarship funded by the Project iENTRANCE@ENL - Infrastructure for Energy Transition and Circular Economy@EuroNanoLab” CUP: B33C22000710006 Consiglio Nazionale delle Ricerche – Istituto per la Microelettronica ed in Microsistemi Bologna (CNR-IMM Bologna) Main seat to carry out the research: CNR-IMM Bologna Supervisor: Meganne Christian (christian@bo.imm.cnr.it)</p> <p>The research carried out in the proposed PhD programme will aim at the development of innovative materials for energy conversion and storage. In particular, 2D-3D heterostructures based on state-of-the art layered materials (e.g. MXenes, TMDs, graphene) will be prepared by gas-phase deposition methods and solution-phase growth approaches, in order to develop hierarchical nanostructures provided with tailored optical, morphological and electrochemical properties. The functional properties of these nanostructures will then be evaluated to be applied to electrochemical energy conversion and storage devices. Depending on the specific properties of the developed materials, the researcher will investigate their application as electro- and photoelectro-catalysts for the production of solar fuels (H₂, CO₂ reduction products), as well as the development of electrochemical super-capacitors. Particular attention will be devoted to the investigation of the structural properties of such materials by electron microscopy techniques, exploiting the available operando setup for the thermal and electrochemical characterization of the liquid environment by high-resolution transmission electron microscopy.</p>
	The PhD candidate should preferably have a degree in Physics, Chemistry,

Skills and competencies for the development of the activity

Materials Science or similar subject.

He/she must display an aptitude for preparation of inorganic materials through gas-phase and solution phase synthetic approaches. He/she must have a solid background in materials science and structural/optical characterization of condensed matter. Previous experience in electrochemical characterization of energy conversion devices is positively evaluated.