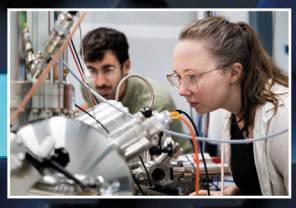
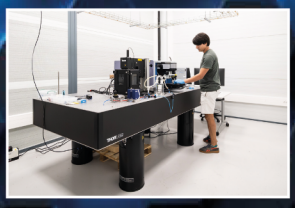
InCAEM project

In situ Correlative Facility for Advanced Energy Materials

Exploring matter in action

Accelerating the energy transition



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Next Generation Catalunya
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Pla de Recuperació, Transformació i Resiliència - Finançat per la Unió Europea – NextGenerationEU

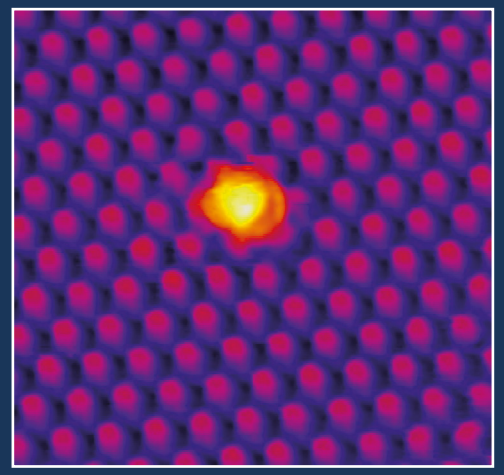
What is InCAEM?

InCAEM is a new **open-access research infrastructure** for in situ and correlative research on **advanced energy materials**, coordinated by **ALBA Synchrotron** and **ICN2**, with partnership of **ICMAB-CSIC**, and **IFAE-PIC**.

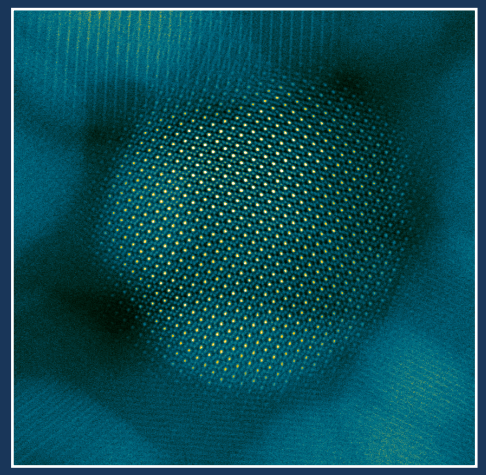
It is a **unique collaborative initiative** to provide the European scientific community with advanced tools for **correlative, multi-length-scale, and operando** characterization of materials for **energy and sustainability**.

InCAEM integrates **(S)TEM** (Scanning/Transmission Electron Microscopy), **SPM** (Scanning Probe Microscopy), and **synchrotron radiation techniques** to explore materials under real working conditions —from the atomic to the micro-scale— to **address the challenges of the European Green Deal**.

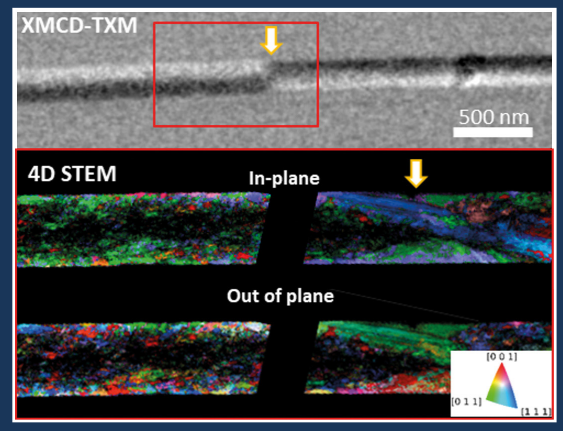
- **Advanced monochromated and double aberration-corrected (S)TEM**, enabling in-situ atomic-scale analysis of materials for energy and environmental applications.
- **Advanced SPM Platform** integrating complementary scanning probe and optical nanoscale techniques for versatile materials characterization.
- **Connection to several ALBA Synchrotron beamlines for correlative in-situ / operando experiments**, through adapted sample holders and transfer systems.



High-resolution scanning tunneling microscopy images of a single fluorinated fullerene ($C_{60}F_{18}$) molecule adsorbed on a monolayer of coronene on a gold (111) surface. The images enable the determination of the exact location of the fluorinated molecule, revealing the preferred interaction geometries with the underlying organic layer. Adapted from *ChemPlusChem* (2025), 2500243.



$FeCo_2O_4$ and $CoFe_2O_4$ spinel-structured nanoparticles for catalytic materials with spin control to improve polysulfide conversion in sodium–sulfur battery electrodes. Reference: *J. Am. Chem. Soc.* 145, 34, 18992 (2023)



Correlative magnetic transmission x-ray microscopy and 4D STEM images of a permalloy nanowire identifying crystal texture at a domain wall pinning site. *Lucía Gómez Cruz, et al.*, submitted.

Beyond the instruments, InCAEM is also a digital infrastructure with robust computing systems for automated AI control of the instruments, automated AI-enhanced data analysis and modelling pipelines to accelerate discovery and innovation.

InCAEM project

InCAEM is a pioneering platform born from collaboration and the shared goal of building a greener, more sustainable future for Europe.

Discover more here:

ALBA

ICN2 Institut Català de Nanociència i Nanotecnologia

ICMAB Institut de Ciència de Materials de Barcelona

Excelencia Severo Ochoa

CSIC Consejo Superior de Investigaciones Científicas

IFAE Institut de Física d'Altes Energies

Excelencia Severo Ochoa

PIC port d'informació científica

This project is part of the **Planes Complementarios Program – Advanced Materials**, co-funded by the **Spanish Ministry of Science, Innovation and Universities**, the **Generalitat de Catalunya**, and the **NextGenerationEU** recovery plan.