



## ADVANCED **NANOCHARACTERISATION**

The wide range of technologies developed by CEA Tech and its partners requires innovative approaches to characterise new materials and device architectures. These include quantum computing, imagers for virtual reality, phase change memory, additive manufacturing materials, catalysts, batteries and fuel cells. An accurate knowledge of the structure and composition of a device is essential in understanding how it works and how it can be improved; and multiscale, multidimensional characterization is crucial for 3D complex heterogenous materials, key for the development of energy technologies.

At CEA Tech, nanocharacterisation is an important part of the R&D process and is essential in accelerating technological developments. As well as meeting existing challenges, it is important to antici-

pate the development of new nanocharacterisation approaches to meet emerging needs. Some of the current challenges include the need for high spatial resolution 3-D analysis due to complex architectures, the use of non-invasive methods for fragile materials and the study of material behaviour in condition as close as possible to real operating conditions. The generation of large volumes of data and the correlation of many techniques on the same sample also requires advanced data acquisition, management and treatment strategies to be developed. The comparison of experimental data with simulations is increasingly important for data interpretation and the ability to supply key information to support modelisation activities is indispensable.

### **WHY A PHD RELATED TO ADVANCED NANOCHARACTERISATION AT CEA TECH?**



In Grenoble, the CEA has a world class nanocharacterisation platform that brings together the state-of-the-art instruments (over 40) and expertise of three CEA institutes : LETI, LITEN and IRIG. The platform benefits also from a strong relationship with the European Large Scale Facilities, ILL (neutron source) and ESRF (synchrotron x-ray source), located close to CEA. This unique combination of advanced instruments allows PhD students to correlate different techniques and get a better knowledge of the materials/ devices studied.

We currently have 30 ongoing PhD projects and a very international outlook. Over half of our students are from abroad, and there are regular scientific seminars for students and

researchers to share their work. The proximity of research groups working on advanced technology means that students have the chance to contribute to the development of innovative processes and devices. They can also request bespoke samples designed to test new characterisation protocols to their limits.

The high demand for skills in advanced characterisation and the strong links we have with industry and academia mean our students have excellent employment prospects after graduation.



CEA-Leti and CEA-Liten Institutes in Grenoble Alpes



30 ongoing PhD projects



# CEATECH SCIENTIFIC AND TECHNOLOGICAL CHALLENGES

CEA Tech tackles the three key and ongoing transitions of the 21st century: numeric, energy and medical ones. For each, CEA Tech research teams innovates within a vibrant network of academic and industrial partnerships, to develop the technologies of the future.

CEA Tech, one of the four CEA research divisions, relies on three large research Institutes, two in Grenoble, Leti and Liten and one in Saclay, List, and a network of technology transfer facilities in Bordeaux,

Nantes, Toulouse, Metz, Cadarache and Lille.

Close to 500 young researchers, prepare their PhD in CEA Tech Labs, with a major contribution to the research teams. They share the successes of the CEA, embodied in leading publications, patents, technology transfers to industry, business and start up creation. For years, Reuters ranks CEA as one of the top three most innovative research organizations in the world (1st, 2nd or 3rd).

## WHY A PHD AT CEA TECH?

Regardless of the field of research you are looking for, willing to explore prospective ideas or to further advanced technologie, you will likely find among CEA Tech doctoral positions the one that meets your expectations.

Then you can join either Leti (1800 p.) and focus on micro and nanotechnologies, embedded electronics, communications, components for the Internet of Things (IOT), cybersecurity, medical devices and healthcare outpatients (at Clinattec) - or Liten (950 p.) to face the challenges of non-CO2 emitting energies (solar, batteries, hy-

drogen, biomass or smart grids) - or List (750 p.) to innovate in terms of data intelligence, cybersecurity and IOT software, manufacturing (4.0 industries), radiotherapy, health data processing - or a research team located in one of the technology transfer facilities (Bordeaux, Nantes, Toulouse, Metz, Cadarache and Lille).

Whatever the topic you select, whatever the career path you envision, joining CEA Tech for your PhD has a deep meaning. On the one hand, you will be dealing with one major societal challenge, deeply rooted in science

and technology. On the other hand, your PhD will be at the heart of highly innovative ecosystems, each offering unique opportunities in research and career paths.

Indeed, CEA Tech offers a highly efficient mix of digital and hardware skills, world-class facilities such as state-of-the-art 300 mm clean rooms, and integration facilities for hydrogen and battery technologies, and many others. CEA Tech's teams form active partnerships with other research organizations and universities, as well as active cooperation with more than 500 industrial partners in France, Europe, North America and Asia.

We will do our best to accompany your success.



CEA-List Institute in Paris Saclay or CEA-Leti Institute in Grenoble Alpes or CEA-Liten Institute in Grenoble Alpes



500 ongoing PhD projects