

Horizon 2020
European Union funding
for Research & Innovation



The CEA (www.cea.fr) is a major French research agency and INAC (www.inac.cea.fr) is one of its institutes, devoted to fundamental research in Materials Science, in the Grenoble Minatec (www.minatec.org) area. The ESRF (European Synchrotron Radiation Facility, www.esrf.eu) is a multinational research institute, situated in Grenoble, France. It operates one of the most powerful synchrotron X-ray source. It offers a highly dynamic, exciting and multinational working environment in the French Alps.

Within a European project, the CEA is seeking to recruit a:

Post-Doctoral Fellow (f/m):

***In situ* synchrotron X-ray monitoring of the growth of defect-free two-dimensional materials by liquid-metal catalytic routes**

THE SUBJECT

The postdoctoral research project is part of a four-year European FET-Open project called LMCat (<http://lmcateu/>) bringing together five European labs, including the ESRF and the CEA-INAC, to develop the growth of defect-free two-dimensional materials by liquid-metal catalytic routes. Two-dimensional materials (2DMs) such as graphene, hexagonal boron nitride or silicene, are currently amongst the most intensively studied classes of materials that hold great promise for future applications in many technological areas. However, the main hurdle against practical utilization of 2DMs is the lack of effective mass production techniques to satisfy the growing qualitative and quantitative demands of high quality 2DMs for scientific and technological applications. Using liquid metal catalysts (LMCats) bears the prospect of a continuous production of 2DMs with unprecedented quality and production speed. However, the current knowledge about the catalytic properties of LMCats is extremely poor, as they had no technological significance in the past. There exists no well-established experimental facilities, nor theoretical frameworks to study the ongoing chemical reactions on a molten surface at elevated temperatures and under a reactive gas atmosphere. A central lab under supervision/collaboration of several scientific/engineering teams across Europe will be established at the ESRF to develop an instrumentation/methodology capable of studying the ongoing chemical reactions on the molten catalyst, with the goal to open two new lines of research, namely *in situ* investigations, especially using synchrotron X-rays, on the catalytic activity of LMCats in general, and unravelling the growth mechanisms of 2DMs on LMCat surfaces in specific. The gained knowledge will be used to establish the first efficient mass production method for 2DMs using the new LMCat technology. This will open up the possibility of exploiting the unique properties of 2DMs on an industrial scale and in every day devices.

THE FUNCTION

The successful candidate will participate in a team of postdocs and PhD fellows who will develop and investigate the growth of 2D materials on liquid metals surfaces using an especially developed growth reactor which will be placed at the ESRF, Grenoble. The growth by chemical vapor deposition at high pressure and temperatures will be characterized *in situ*, by means of two main techniques: Raman and X-ray scattering (Grazing Incidence X-Ray Scattering and Reflectivity). It will be complemented by theoretical calculations performed in Munich. More specifically, the successful candidate will be in charge; together with a PhD student, of the *in situ* synchrotron X-ray scattering measurements, which will make use of the ESRF ID10 liquid scattering beamline (<http://www.esrf.eu/UsersAndScience/Experiments/CBS/ID10>) and diffractometer as well as of the P08 beamline of PETRA-III and the LISA diffractometer (photon-science.desy.de/facilities/petra_iii/beamlines/p08_highres_diffraction/index_eng.html), in Desy.

The candidate will have a unique opportunity to collaborate with a diverse group of multidisciplinary researchers from Greece, Germany, The Netherlands and France. She/he will be under the supervision of Gilles Renaud from CEA/INAC and of Oleg Konovalov, the ESRF scientist in charge of the ID10 beamline.

QUALIFICATIONS AND EXPERIENCE

You should hold a PhD in physics, chemistry or material science or closely related science. Previous experience of complex instrumental environment, MBE or CVD growth methods and / or with synchrotron X-ray scattering / diffraction / reflectivity, especially on liquids, will be an advantage. You should be motivated to work with an international team of young researchers with an experimental setup at the forefront of instrumental development, and ready to travel in Germany (Hambourg) for extended periods to perform some of the experiments. A good practice of English is mandatory. You should also have:

- Experience of data analysis and analysis program development using e.g. C or Python programming;
- Experience or knowledge of relevant research topics in solid state physics or surface science;
- Ability and initiative to get to the heart of the problem and take it effectively through to completion;
- Good interpersonal, communication and presentational skills;
- Good organisational and planning skills;
- Ability to interact effectively with others at all levels;
- Ability to work as part of a multi-disciplinary team;
- Self motivation;
- Must be available to travel abroad, especially in Germany, including overnight absences.

APPLICATION:

This is a full time, 3 year fixed term contract.

Located at Grenoble, ESRF with several experiments in Hamburg (Desy-Petra-III)

Interested applicants should submit

- (1) 1 page cover letter stating the motivation, research experience and goals, and anticipated available date;
- (2) curriculum vitae, and
- (3) contact information for 3 references (reference letters are not required at this time)

to Gilles Renaud:

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Application deadline: October 30, 2017