



Are you interested in working with an international team of researchers, with an experimental setup at the forefront of instrumental development?

Join the ESRF, the European Synchrotron!

The ESRF, the European Synchrotron, is an international research facility based in Grenoble, France. Thanks to high-level, innovative engineering and cutting-edge vision, the ESRF is recognised as one of the top research institutions worldwide, welcoming more than 6 500 scientists every year in fields such as biology, medicine, chemistry, earth and environmental sciences, cultural heritage, materials and surface science, and physics. The ESRF is supported by 22 countries and employs 650 staff.

We are currently seeking to recruit a:

PhD Thesis Student

Subject: Formation of two-dimensional materials on liquid metal catalysts: *in situ* synchrotron X-ray study
ref. CFR428

JOB DESCRIPTION

This PhD thesis research is part of a four-year European FET-Open project called LMCat (<http://lmcat.eu/>) 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 are no neither 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 of several scientific/engineering teams across Europe will be established at the ESRF to develop an instrumentation and 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.

You will join 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, you will be in charge, together with a PostDoc, 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. This will be a unique opportunity to collaborate with a diverse group of multidisciplinary researchers from Greece, Germany, The Netherlands and France. You will work under the supervision of Oleg Konovalov, the ESRF scientist in charge of the ID10 beamline (5 people), and of Gilles Renaud from CEA/INAC.

Further information may be obtained from Oleg Konovalov (tel.: +33 (0)4 76 88 27 31, email: konovalov@esrf.fr).

PROFILE, SKILLS AND EXPERIENCE

- Degree allowing enrollment for a PhD (such as MSc, Master 2 de Recherche, Laurea or equivalent) in chemistry, physics, materials science or closely related science
- Experience of data analysis and analysis program development using C or Python programming is an advantage
- A background in X-ray scattering/diffraction/reflectivity or/and MBE/CVD growth methods is a plus.
- Proficiency in English (working language at the ESRF)

WORK CONDITIONS

Contract of two years renewable (subject to satisfactory progress) for one year. The monthly gross salary will be 2364 €. Professional trips, especially to Germany, will be necessary for this project (including overnight absences).

The ESRF is an equal opportunity employer and encourages diversity.

If you are interested, please apply on <http://www.esrf.fr/Jobs> by November 26th 2017.

ESRF, The European Synchrotron (www.esrf.eu)

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