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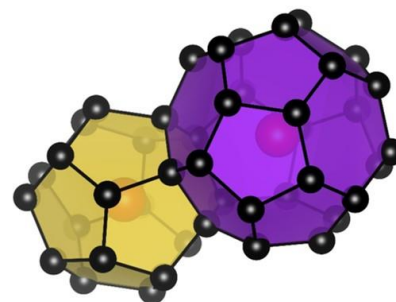
## Postdoctoral position in ICube laboratory, MaCEPV team

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### Exotic silicon: silicon clathrate films

Starting date: 01/11/2022

Duration: ~18 months



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#### Context

Several forms of silicon are used in industry, mainly crystalline, multicrystalline and amorphous silicon. Here we propose to investigate a novel form of silicon films, namely silicon clathrates. They are similar to carbon fullerenes as they form hollow spheres. The electronic and optical properties of these clathrates are strongly different to the “standard” silicon (direct bandgap) and can pave the way for novel applications in electronics and optoelectronics, but also potentially in batteries and hydrogen storage. A large part of the project will be to modulate the properties of Si clathrate films by varying the fabrication processes. The fabricated Si clathrates films will need to be analyzed in terms of structural, optical, electrical, surface properties by a wide range of techniques. In particular, not only the size of the clathrates but also the presence of doping atoms can dramatically modify their properties.

#### Research activities

ICube laboratory is one of three laboratories (Colorado School of Mines, Gifu University, ICube) able to fabricate silicon clathrate films. Deeper understanding of the clathrate properties, tuning of their properties, and work towards devices is necessary.

Website of the ICube laboratory <http://icube.unistra.fr/>

Website of the MaCEPV team of ICube <https://macepv.icube.unistra.fr/>

The postdoctoral researcher will be mainly in charge of the fabrication and characterizations of silicon clathrate films both in the ICube (T. Fix) and IPCMS (A. Dinia) laboratories. He will interact remotely and in person with the INL laboratory in Lyon (C. Chevalier). He will interact with the staff of the different platforms and with theoreticians working within the project (D. Stoeffler, IPCMS). He will participate in the reporting work within the project.

#### Bibliography

*Synthesis and Characterization of Silicon Clathrates of type I  $\text{Na}_8\text{Si}_{46}$  and type II  $\text{Na}_x\text{Si}_{136}$  by Thermal Decomposition*, R. Vollondat, S. Roques, C. Chevalier, J. Bartringer, J. L. Rehspringer, A. Slaoui, T. Fix, *Journal of Alloys and Compounds* **903**, 163967 (2022) <https://doi.org/10.1016/j.jallcom.2022.163967>

### **Scientific environment**

The work will be performed in Strasbourg, France in the ICube and IPCMS laboratories, 23 rue du Loess, 67037 Strasbourg, France. Short stays in the INL laboratory in Lyon may be necessary, as well as attending meetings and conferences.

The project is within the framework of the ANR 2022 project EXOSIL between ICube, IPCMS and INL (Lyon).

### **Profile and requested skills**

#### **Required**

- Doctoral Degree in physics, chemistry, chemical engineering or materials science, preferably with a thesis related to films or silicon
- Experience in experimental physics
- Knowledge in materials science, fabrication of materials and structural characterizations
- Good presentation skills and excellent written and oral English level (certified with a high TOEFL score or equivalent)
- Team work skills and innovation capabilities

#### **Highly desirable**

- Previous interaction with theoreticians
- Knowledge in silicon
- Knowledge in ion implantation
- Knowledge in optoelectronic properties

### **Salary**

About 2160 € net (gross salary 2740 €)

### **Supervisor**

Dr Thomas FIX, CNRS Researcher, ICube: [tfix@unistra.fr](mailto:tfix@unistra.fr)

### **Application procedure**

Please send motivation letter, CV, list of publications, and contact details of two referees to [tfix@unistra.fr](mailto:tfix@unistra.fr) with the following email subject: [POSTDOC CLATHRATES]

### **Closing date for applications**

01/10/2022 at 12:00