Direction
des **ressources humaines**
Université de Strasbourg

Position description

1. Position identification

Title of post : Postdoctoral study on substitution of silver and indium in solar cells

Type of contract : Postdoctoral

Category (A, B or C) : A

Contract/project period : 18 months Expected date of employment : 01/10/2025

Proportion of work : full time

Workplace : ICube, D-ESSP departement, MATISEN team

Desired level of education : has a PhD

Experience required : doctorate obtained within the last 3 years

Contact(s) for information on the position (identity, position, e-mail address, telephone) : Thomas Fix, CNRS Researcher, tfix@unistra.fr, +33(3)88106334

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Closing date for the receipt of applications : 01/06/2025

2. Research project or operation

In order to significantly contribute to limiting global warming, the annual production capacities of photovoltaic (PV) modules must reach values as high as 3 TeraWatt (TW) over the next decade. While PERC (Passivated Emitter and Rear Cell) technology currently dominates the photovoltaic industry, new solar cell technologies such as Si heterojunctions, TOPCon type devices, Perovskite/Si tandem, are entering the market and enabling to improve efficiency. These new technologies generally use silver (Ag)-based metal electrodes and indium tin oxide (ITO) layers. However, due to limited In and Ag resources, their presence poses major problems for the necessary deployment at TW scale. Several interesting "high TRL" approaches for Ag and In reductions have been explored in recent years. However, the progress rates of these incremental developments are far from consistent with the aforementioned TW-scale deployment and may also raise environmental concerns.

The ICube laboratory in Strasbourg and CROMA in Grenbole are engaged in a large-scale research program (ANR) with 7 other partners to propose new solutions for the substitution of silver and indium in solar cells. As a postdoctoral researcher in this project, you will participate, in collaboration with the 7 other partners, in the development of new solutions to reduce the environmental impact of the production of future solar cells.

3. Activities

➢ **Description of the research activities :**

The research activities will take place at two locations, the ICube laboratory (UMR 7357 in Strasbourg) and at the CROMA laboratory (UMR 5130 in Grenoble). This postdoctorate aims at fabricating and characterizing thin films and devices for photovoltaics. In particular, the electric properties of materials will be studied using standard techniques (IV, CV, Hall effect...). As well the interfaces (between the transport layer /TCO and dielectrics or semiconductors) will be evaluated for their integration into PV solar cells, by electrochemical impedance spectroscopy (admittance, noise) to determine the presence of charge, defects, interface states, tunnel/hopping/hysteresis phenomena ... Moreover the electronic properties at the macro and micro scale will be studied by AFM, scanning Kelvin probe, photoemission, surface photovoltage...

The solar cells and devices integrating transport/TCO layers developed within the project will be evaluated before and after stability tests by standard photovoltaic techniques (IV under illumination, EQE, SunVoc, ...).

➢ **Related activities :**

Depending on the calendar at the needs related to project deliverables the recruited candidate may participate in thin film and device fabrication before their characterizations.

4. Skills

➢ **Qualifications/knowledge** :

Candidates must hold a doctorate in physics or chemistry or materials or engineering within the last 3 years. Knowledge in materials science and semiconductors is necessary and demonstrated by the validation of courses/modules in those disciplines. Knowledge in photovoltaic solar cells is well appreciated. Experience in thin film growth or characterization is welcome.

➢ **Operational skills/expertise :**

Candidates must be able to use common scientific software. They are advanced both in written and spoken English, validated by language certificates. Candidates must be able to write reports and present high level scientific work in French and/or English.

➢ **Personal qualities :**

Candidates must be familiar with project- and team- work both locally and remotely. They must be autonomous and rigorous, be able to take initiatives and be at ease with oral and written communication.

5. Environment and context of work

➢ **Presentation of the laboratory/unity :**

ICube is a joint research laboratory of the CNRS and the University of Strasbourg, with about 750 members shared at the interface between digital and physical sciences, providing a unique configuration. It is a major driving force for research in Strasbourg. Federated by imaging, its main areas of application are biomedical engineering and environmental and sustainability sciences.

The CROMA laboratory is a joint research laboratory of the University Grenobles Alpes, University of Savoie Mont Blanc and CNRS, previously known as IMEP-LaHC. It is composed of three teams which are microelectronics, photonics and radiofrequencies.

➢ **Hierarchical relationship :**

The recruited candidate will be supervised by Thomas Fix, CNRS researcher at ICube under the authority of ICube's Director, and supervised by Frédérique Ducroquet, CNRS researcher at CROMA under the authority of CROMA's Director.

➢ **Special conditions of practice (notice attached):**

This position is located in a sector relating to the protection of scientific and technical potential. It therefore requires, in accordance with the regulations, that your arrival be authorized by the competent authority of the French Ministry of Higher Education and Research