1 PhD student investigating material criticality in the life-cycle of photovoltaic modules

University of Liège, Chemical Engineering (Belgium)
BRGM, the French Geological Survey (Orléans, France)

We are looking for a PhD student who will investigate the critical raw materials required in the life-cycle of silicon-perovskites tandem solar cells. This is a three-year contract funded by the PEPPERONI project (Horizon Europe). It will be shared between two locations : UniLiege in Belgium (18 months) and BRGM in France(18 months).

Duration: 36 months (3 years)
Locations: 50 % Liège (Belgium), 50% Orléans (France)
Category: Engineering – Environment, Materials, Processes
Tentative title: Criticality of products and components in the life-cycle of silicon-perovskite tandem solar modules
Salary: around 2600 euros/months
Employer: University of Liege

PEPPERONI project description:

PEPPERONI is a four-year Research and Innovation project co-funded by the European Union under Horizon Europe and supported by the Swiss State Secretariat for Education, Research and Innovation that started on 1 November 2022. PEPPERONI will advance the perovskite/silicon tandem photovoltaics (PV) technology towards market introduction and mass manufacturing. The project, coordinated by Helmholtz-Zentrum Berlin (DE) and Qcells (DE) will identify and address the barriers to tandem solar technology's market introduction, and ultimately lay the foundations for fast implementation of new production capacity in Europe as a cost-effective and resource-efficient solution to decarbonise the energy system. The PEPPERONI consortium counts 17 partners from 12 European countries and it combines knowledge and expertise from fundamental research to small-scale testing and development of solar cells all the way to high-throughput industrial manufacturing of large solar modules.
Website: www.pepperoni-project.eu

Context:

Limiting climate change while maintaining acceptable living conditions requires a global energy transition from fossil fuels towards renewable and low-carbon energies. According to IPCC, developing solar technologies if one of the most efficient ways to produce energy while reducing greenhouse gas emissions worldwide. Unfortunately, renewable technologies, including solar, tend to consume some mineral raw materials in much greater amounts than fossil fuel technologies do.

As the world consumption of mineral raw materials is set to accelerate, there are raising concerns over the reliability and ethics of raw material extraction and supply for the energy transition. The energy transition turns out as a material transition, which raises new socio-environmental impacts.
In order to secure the supply of important raw materials and prevent unacceptable socioenvironmental impacts, public and private institutions rely more and more on material criticality assessment. Critical raw materials are those that are deemed "essential" for an entity such as a country, a sector, or a company, and that have a high risk of supply disruption to this entity. Thus, reducing criticality mitigates the risk of supply crises. However, major supply risks and vulnerabilities also weigh on non-raw materials such as transformed products and components. The research question to answer during the PhD could be: "How is the criticality of a product related to the criticality of the substances involved in its life cycle".

Main objectives:

- To understand the manufacturing processes involved in the fabrication of silicon-perovskite modules
- To map the mineral raw material supply chains of the modules using public data and data provided by the consortium partners
- To harmonize criticality and life-cycle data
- To propose a criticality assessment method that is applicable to transformed products and components
- To apply the method and identify the hot spots of criticality along the supply chains of given PV modules
- To provide criticality mitigation recommendations depending on the type of supply risks and vulnerabilities

Profile:

- Master's degree in chemical engineering, energy, economics, or environmental sciences
- High interest in mineral resources, low-carbon technologies (especially photovoltaics), socioenvironmental questions, industry, geopolitics, and their future evolution
- Familiar with life-cycle assessment (knowledge of associated databases and tools such as Ecoinvent, OpenLCA, and GaBi, is a plus)
- Knowledge of English (speaking in front of an audience, reading, writing reports and articles). Knowledge of French is a plus.
- Scientific mindset, rigorous and well organized. Creativity and eager to discover new things and propose new approaches.
- Not afraid to manipulate and analyze a lot of numerical data from different scientific fields
- Good relational intelligence, autonomy, open-mindedness

Submission of applications

The contract will start on October 1st 2023

Applications must be sent before August 31, 2023 by mail or email to the secretariat of the Chemical Engineering department (secretary.chemeng@uliege.be) and to BRGM human resources department (brgm-recrutement@brgm.fr)

The complete file will include:

- a motivation letter
- a curriculum vitae
- master degree transcript

If you have any questions, please contact Angélique Léonard (a.leonard at uliege.be) and Antoine Boubault (a.boubault at brgm.fr)