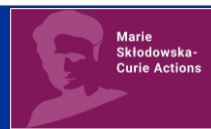




Open PhD Position in European Industrial Doctoral Network (DN-ID)



www.cesaref.eu

Concerted European action on Sustainable Applications of REfractories (CESAREF)

What is CESAREF and what is the focus of this network?

CESAREF will train researchers in multi-engineering areas and expose them to the academic and non-academic sectors through international and inter-sectoral mobility combined with an innovation-oriented mind-set. They will get the right combination of research-related and transferable competences in the **full production-to-the-end-of-life cycle of refractory materials applied to Iron & Steelmaking processes** with regards to the new operation conditions requested by the drastic reduction of greenhouse gas emissions, improved energy efficiency, and by life cycle assessment requirements. An important part of the project will be dedicated to the sustainability of refractories, including recycling issues, using the **Life Cycle Assessment** methodology. **15 doctoral candidates** will take advantage of the most sophisticated numerical tools and laboratory equipment to model, design and predict the life of refractory materials in critical operational conditions. Being trained in scientific, technical, and soft skills, these PhDs are the next generation of highly employable scientists and engineers in the refractory sector and related areas. New testing methods and models will be developed to address the Scientific/Technological challenges for these applications and help to design better performing and sustainable refractory materials and linings. The research training is implemented through strong relationships between 10 academia and 16 industrial partners across the EU. The CESAREF network (www.cesaref.eu) is structured to take full advantage of intensive cooperation between **academia, raw material suppliers, refractory suppliers and high-tech metal component producers** with a direct link to the **FIRE federation** (fire-refractory.org).

Specific subject of PhD13 (one of 15 PhD's of the CESAREF DN-ID project)

PhD13 Topic: Performance prediction and reusability/recyclability assessment of refractory materials using online sensing, machine learning and digital decision-making tools

Objectives: The ability to predict in-service evolution and reusability of refractory materials is critical to maximize material lifetime and reduce operational costs. The in-service evolution of thermo-chemico-mechanical properties need to be perfectly understood and predictable. Industrial scale non-destructive sensing combined with machine learning algorithms will then be implemented to develop an accurate numerical model to evaluate the reusability and recyclability of refractory parts.

Expected Results: Pertinent non-destructive sensing approach will be investigated at both laboratory scale and on-site, to assess thermo-chemico-mechanical properties evolution of refractory parts in service. Thanks to available industrial experience, novel sensing methodologies will be developed to generate data that will be used to train machine learning algorithms. A digital tool will be implemented to help the end-user to take 4R (Reduce, Reuse, Recycle and Replace) decisions.

Keywords: Sensors, Non-destructive testing, data acquisition, machine learning, data science, data mining, refractory materials, high temperature processes.

Applicant Profile: **Master's level in Materials Science and/or Industrial Engineering**. Candidates should have an in-depth knowledge in programming, data analysis and/or machine learning. Oral and written communication skills (English) are mandatory.

PhD main locations:

Period 1 - VESUVIUS (www.vesuvius.com), Ghlin, Belgium (18 months)

Period 2 - IRCER (www.ircer.fr), Limoges, France (18 months)

Due to the Mobility Rule by the funding agency, residents of Belgium cannot apply for this PhD13 position

Apply until Oct. 2nd following indications at www.cesaref.eu/phd-recruitment-procedure

If you have any questions, feel free to contact the supervisors:

Prof. Marc HUGER, marc.huger@unilim.fr

Johan RICHAUD, johan.richaud@vesuvius.com

This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement no.101072625