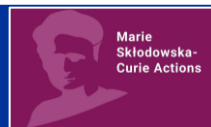




Open PhD Position in European Industrial Doctoral Network (DN-ID)



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 PhD6 (one of 15 PhD's of the CESAREF DN-ID project)

PhD6 Topic: Microstructure design of refractory castables for in use thermomechanical properties optimization

Objectives: Investigate different model refractory castables linked to direct iron reduction by hydrogen. Considering White Fuse Alumina (instead of Tabular Alumina) with potential to be fused using green electricity in Europe (Austria, Germany). Targeting high purity silica-free systems with good potential resistance in hydrogen atmospheres. Playing with stoichiometry of pre-formed or in-situ spinel grains. Considering different degree of pre-mullitization of Andalusite grains. Understanding to which extend the thermal shock resistance can be optimized through microstructural fine-tuning.

Expected Results: Better understanding of complex structure and microstructure evolution within castable versus temperature (with and without hydrogen atmosphere) and of the macroscopic thermomechanical properties resulting from these evolutions. Establishing a set of rules for better design of castable microstructure that can sustain future industrial conditions.

Keywords: Minerals, microstructure, refractory, thermo-mechanics

Applicant Profile: **Master's level in Materials Science and/or Materials Engineering.** Candidates should be excellent in their skills for experimental characterisation technics and knowledge of materials science, refractories and/or ceramics. A specific skill in thermomechanics is also required. Oral and written communication skills (English) are also required.

PhD main locations:

Period 1 - IMERYS (www.imerys.com), Lyon, France (18 months)

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

Due to the Mobility Rule by the funding agency, residents of France cannot apply for this PhD6 position

Apply until June 27th following indications at www.cesaref.eu/recruitment-procedure

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

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