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 PhD4 (one of 15 PhD's of the CESAREF DN-ID project)

PhD4 Topic: Use of metallurgical residues as potential raw materials for high performance refractory castables

Objectives: Extractive metallurgy processes are not suitable for lower-grade resources with impurities. Therefore this PhD study aims at advanced metal-extraction and recovery methods of slags from metallurgical processes. In order to produce nearly zero-waste results, it focuses on upcycling the residual matrices into engineered refractory products, namely alternative calcium aluminate binders and alumina-spinel castables for refractory linings. In order to test the engineered refractory materials into industrial conditions, assessment of thermomechanical behaviour of the refractory castables in service conditions is in regard.

Expected Results: Characterization and establishment of eco-friendly and cost-effective technologies that are capable of extracting critical metals from metallurgical residues. Mineral processing route of fines as well as grog aggregates and transfer of residues into refractory castable formulations for metallurgical application. Microstructural examination and assessment of mechanical strength and high temperature performance of castables in use.

Keywords: Residues, extractive metallurgy, castables

Applicant Profile: **Master's level in *Materials Science, Materials Engineering or Metallurgy***. Candidates should be excellent in their skills for experimental work, knowledge of material physics and/or heat transfer mechanisms, oral and written communication skills (English). Knowledge of sample preparation and instrumentation will be appreciated.

PhD main locations:

Period 1 - Calderys GmbH (www.calderys.com), Neuwied, Germany (18 months)

Period 2 - RWTH Aachen University (www.rwth-aachen.de), Aachen, Germany (18 months)

Due to the Mobility Rule by the funding agency, residents of Germany cannot apply for this PhD4 position

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

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

Prof. Jesus GONZALEZ, gonzalez@ghi.rwth-aachen.de **Dr. Thorsten TONNESEN,** tonnesen@ghi.rwth-aachen.de

Dr. Bruno TOUZO, bruno.touzo@imerys.com **Dr. Steffen MOEHMEL,** steffen.moehmel@imerys.com

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