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 PhD12 (one of 15 PhD's of the CESAREF DN-ID project)

PhD12 Topic: Corrosion and changes of microstructure and thermal properties of refractory castables in industrial H_2 combustion atmospheres

Objectives: Particular components of furnace linings and refractory microstructure will be identified in regard of their corrosion behaviour in atmospheres with enhanced H_2 amount. Reduction of refractory constituents and components will be observed. FactSage calculations of refractory materials and various combustion atmospheres are of interest and will be helpful tool to work such corrosion behaviour. Furthermore, mechanical HT performance will be observed by HMOR, Youngs Modulus and DIC measurements.

Expected Results: Numerical simulations according to thermodynamic considerations as well as reaction kinetic modelling. Examination of the corrosion and wear mechanisms of the castable materials and their particular bonding phases in regard to various parameters such as combustion atmosphere, temperature and temperature changes. Determination of the applicability of residues as refractory binders and examination of mechanical behaviour at high temperatures.

Keywords: Hydrogen, Corrosion, Refractories, Simulation, Mechanical behaviour

Applicant Profile: **Master's level in *Materials Science, Materials Engineering, Metallurgy, Chemistry or Applied Physics***. 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 - RHI Magnesita (www.rhimagnesita.com), Leoben, Austria (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 Austria cannot apply for this PhD12 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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