



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 PhD11 (one of 15 PhD's of the CESAREF DN-ID project)

PhD11 Topic: Influence of H₂ containing atmospheres on the thermo-mechanical behaviour of refractories

Objectives: The objective of the PhD is to understand and quantify the effect of long-term exposure of refractories to H₂ containing atmospheres at elevated temperatures on the macroscopic thermomechanical behaviour of selected refractories. Creep, mode I fracture behaviour and Young's modulus will be investigated under oxygen atmosphere prior and after H₂ exposure. Furthermore, Fact Sage calculations and mineralogical investigations will be carried out to understand the changes and to give hints for product development.

Expected Results: The results describe the change of phases in refractories and especially in the microstructure as well as kinetics of these phase changes in H₂ containing atmospheres. Main phases attacked will be determined. Creep parameters, mode I fracture parameters and Young's modulus for the materials exposed to different H₂ containing atmospheres will be determined. Finally following questions will be answered: Is a material considered as stable material under industrial conditions? Under which conditions is it stable?

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 refractories is preferred, oral and written communication skills in English are a prerequisite. Experience in sample preparation is appreciated.

PhD main locations:

Period 1 - Tata Steel (www.tatasteeleurope.com), IJmuiden, The Netherlands (18 months)

Period 2 - Montanuniversitaet Leoben (www.unileoben.ac.at), Leoben, Austria (18 months)

Due to the Mobility Rule by the funding agency, residents of The Netherlands cannot apply for the PhD11 position

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

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

Priv.-Doz. DI Dr. Dietmar GRUBER, dietmar.gruber@unileoben.ac.at

Dr. Sido SINNEMA, sido.sinnema@tatasteeleurope.com

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