

ATHOR – Advanced ThermoMechanical multiscale mOdeling of Refractory linings



The international ATHOR network is firstly dedicated to train Early Stage Researchers (ESRs) in multi-engineering fields for a better understanding of thermomechanical behaviour of refractory linings used in ironmaking and steelmaking. Through a multiscale approach, the project will cover all the main features of thermomechanical analysis of refractory linings including the influence of microstructures on material behaviour, the impact of corrosion on thermo-mechanical properties, the thermal shock resistance, the modelling of non-linear thermomechanical behaviours, the instrumentation of industrial vessels and the measurement of properties in operation conditions.

With a total of 14 international partners, including 8 industrial companies and 6 universities, the young researchers will have the opportunity to collaborate with experts in various research groups and will take advantage of the most sophisticated numerical tools to model, design and predict the life of refractory lining configurations in critical operation conditions. Being trained in scientific, technical and soft skills, the 15 ESRs selected in the program will be the next generation of highly employable scientists

and engineers in the refractory industry and related areas.

The network regroupes University of Limoges/FR, University of Science and Technology/PL, University of Aachen/DE, University of Leoben /AT, University of Orléans /FR, University of Minho/PT, Altéo Alumina/FR, Imerys Refractory Minerals/AT, Magnesita Refractories/DE, Pyrotek/SE, RHI AG/AT, Saint-Gobain/FR, TataSteel/NL and FIRE/CA. Thanks to the European Union Research and Innovation programme – Horizon 2020, this 4 year European Training Network Programme will start in October 2017 as a Marie-Sklodowska-Curie action (Grant #H2020-MSCA-ITN-2017-764987).

New testing methods and models will be developed to address the scientific and technological challenges for these industrial applications and help to develop better performing refractory materials and linings. The current financial situation of the European steel industry urges the producers to dramatically reduce their production costs. This project is expected to substantially contribute to find solutions through the design of more robust and more reliable refractory linings. Not only the total cost of refractory materials is then reduced, but the equipment's avail-

ability and the process control are improved. In addition to the large energy savings that are one of the primary concerns of the industrial partners, the project will help to dramatically reduce the environmental impact of high temperature processes.

The refractory industry is under constant pressure for more research and development to cope with new and more demanding iron and steelmaking process requirements. The concerted work in the ATHOR program will focus on the steel ladle as a model vessel. The steel ladle is the core of the steelmaking process and is a major refractory consuming vessel representing about a quarter of all the refractory consumption. Steel ladle practices significantly differ between regions and between steel plant according to the metallurgical processes, the operation conditions and the refractory concepts. Based on their purpose and location in the ladle lining, the properties required for the refractory material varies from high thermal stability, high erosion resistance, high corrosion resistance, thermomechanical stability, impact resistance, flexibility to creep resistance.

The primary challenges for both the European steel and refractory manufacturers are linked to the cost and availability of raw materials and energy, and to environmental and climate change regulation. Furthermore, the European iron and steel industry is eager to increase its competitiveness through new initiatives. The ATHOR program will help all partners to face more and more aggressive market conditions. The continuous development of refractory products is of utmost importance for the EU highly energy-intensive materials industries. Through the ATHOR network and long term partnership, all partners are deeply committed to provide a combination of research and training activities which will support and enlarge the initiative of the Federation for International Refractory Research and Education (FIRE).

For more information, visit the ATHOR website at www.etn-athor.eu or contact the General Coordinator, Prof. Marc Huger, University of Limoges/SPCTS, marc.huger@unilim.fr