

SCIENCE BASED MATERIALS DEVELOPMENT FOR POWER ENGINEERING

The consortium combines the expertise of a steelmaker, a utility company, an engineering consultant company and eight research organizations and universities from EU and Eastern Partnership countries.



Fraunhofer Institute for Mechanics of Materials, Freiburg (Germany)



RWE Generation SE, Essen (Germany)



Institute of Physics of Materials, Brno (Czech Republic)



Engineering Academy of Armenia, Yerevan (Armenia)



Chalmers University of Technology, Gothenburg (Sweden)



IPP Centre LLC, Kyiv (Ukraine)



Saarschmiede GmbH Freiformschmiede, Völklingen (Germany)



Technical University of Denmark, Kongens Lyngby (Denmark)



Technische Universität Graz, Graz (Austria)



Georgian Technical University, Tbilisi (Georgia)



Paton Electric Welding Institute, Kyiv (Ukraine)

The course will take place at the Georgian Technical University in Tbilisi. The precise location will be announced. The participation is free of charge.

Who should attend

The course is designed for advanced and PhD students in Material Science, Mechanical Engineering, Energetics and Physics. Post-doctoral scientists and interested faculty members are also welcome.

Abstracts of the lectures will be uploaded to the website www.z-ultra.eu as soon as they are available.

Registration and contact

Registration is required, since the course can only take place, if a sufficient number of registrations is received by 1 September 2014. For registration please send an e-mail to:

Professor Dr. Hermann Riedel

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with cc to ekutelia@gtu.ge

The local contact person is

Professor Dr. Elguja Kutelia

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Short Course, Tbilisi, Georgia
29 September – 1 October 2014



Photo courtesy Saarschmiede

Z-ULTRA: A EUROPEAN PROJECT

Z PHASE STRENGTHENED STEELS FOR
ULTRA-SUPERCritical POWER PLANTS





KW Neurath BoA 2&3, source: RWE

SCIENCE BASED MATERIALS DEVELOPMENT FOR POWER ENGINEERING – THE EUROPEAN Z-ULTRA PROJECT

Short Course, Tbilisi, Georgia
29 September – 1 October 2014

International experts will introduce you into the principles of modern computational materials engineering together with the corresponding experimental methods. The lectures are grouped around work in the European Z-ultra project (www.z-ultra.eu). The project aims at developing new heat resistant steels which allow increasing the thermal efficiency of fossil power plants to over 50 %, which is 30 % higher than the standard in most existing power plants. CO₂ emissions are reduced accordingly.

The modelling activities range from atomistic theories over thermodynamic and kinetic models for microstructural evolution to macroscopic component design based on the finite element method. Experimental methods include methods with atomic resolution (atom probe tomography and high resolution transmission electron microscopy) as well as ageing, corrosion, creep, fatigue and internal friction tests.

www.z-ultra.eu

Monday, 29 September 2014

- 9:30 Welcome**
Elguja Kutelia, Georgian Technical University
- 9:45 Introduction and overview**
Hermann Riedel, Fraunhofer IWM, Freiburg, Germany
- 10:15 Z-ultra – the idea**
John Hald, Technical University of Denmark, Lyngby
- 11:00 Coffee break**
- 11:30 Nanoscale experiments: Introduction to microscopy and microanalysis techniques**
Hans-Olof Andrén, Chalmers University of Technology, Gothenburg, Sweden
- 12:15 Lunch break**
- 13:30 Microstructure development in 9 to 12 % Cr steels**
Hans-Olof Andrén, Chalmers University of Technology, Gothenburg, Sweden
- 14:15 Introduction to nanoscale modelling of solids: from density functional theory to atomistics**
Matous Mrovec, Fraunhofer IWM, Freiburg, Germany
- 15:00 Coffee break**
- 15:30 Nanoscale modelling: Application to Z-phase steels**
Matous Mrovec, Fraunhofer IWM, Freiburg, Germany

Tuesday, 30 September 2014

- 9:30 Thermodynamics of alloys: Introduction and application to Z-phase steels**
Ales Kroupa, Institute of Physical Metallurgy, Academy of Science of the Czech Republic, Brno
- 10:15 Kinetics of microstructure evolution: Introduction and application to Z-phase steels**
Jiri Svoboda, Institute of Physical Metallurgy, Academy of Science of the Czech Republic, Brno
- 11:00 Coffee break**

- 11:30 Creep tests and modelling**
Surya Yadav, Graz University of Technology, Austria
- 12:15 Lunch break**
- 13:30 Fundamentals of internal friction and application to heat-resistant steels**
Elguja Kutelia, Georgian Technical University
- 14:15 Welding: Introduction with special reference to creep resistant chromium steels**
Valentine Skulsky, Paton Electric Welding Institute, Kyiv, Ukraine
- 15:00 Coffee break**
- 15:30 Mathematical simulation of welding**
Oleg Makhnenko, Paton Electric Welding Institute, Kyiv, Ukraine

Wednesday, 1 October 2014

- 9:30 Z-ultra II – progress in alloy development**
John Hald, Technical University of Denmark, Lyngby
- 10:15 Guiding principles in material selection**
Cecilia Poletti, Graz University of Technology, Austria
- 11:00 Coffee break**
- 11:30 Power plant technology 1**
Paul Lemmens, Kreivo and EU, Belgium
- 12:15 Lunch break**
- 13:30 Power plant technology: Demonstration parts in Z-ultra**
Andryi Oryniak, IPP Centre, Kyiv, Ukraine
- 14:15 Finite element analysis: Introduction and application to power plant components**
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- 15:00 Coffee break**
- 15:30 European exchange programs**
Janina Zimmermann, Fraunhofer Society, Munich, Germany