

Scope / Speakers

The properties of materials strongly depend on their microstructure. The microstructure is the result of phase transformations occurring during appropriate heat treatments. Since these treatments are limited in time, stable as well as metastable phases may participate in these reactions. It is thus very important to know about these stable and metastable phase equilibria in the field of materials development and optimization.

In practice materials are multi-component systems. Their phase equilibria can only be obtained using numerical techniques. This gave rise to the computational thermodynamics which is based on a description of the thermodynamic functions by appropriate modelling. The parameters of these functions are obtained from experimental data by optimization methods. At present thermodynamic databases are available for various classes of materials representing a valuable tool for materials development and for the solution of complex technological problems.

The calculation of stable and metastable phase equilibria as function of temperature and composition provides the basis for determining the effect of alloying elements on the precipitation behaviour. Similarly, chemical reactions can be calculated under various boundary conditions yielding the input for process simulation. The calculation of equilibria under time dependent conditions leads to reaction paths.

It is the aim of this training course to present the actual status of various software packages for thermodynamic calculations and to

give a comprehensive and comprehensible overview of the applications. A wide field of materials will be covered, ranging from steels, electronic materials, noble metals, solders and amalgams. Specific examples of industrial applications will be presented. In addition, broad room will be given to live and interactive demonstrations in order to give a good insight into the handling of the different types of software.

The training course addresses to materials research and development departments in industry and at universities.

Chairman of the seminar is **Prof. Dr. Gerhard Inden**, retired from Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf

Further speakers are:

Dr. U. Diekmann
Metatech GmbH, Kamen

Dr. C. Ernst
Deutsche Edelstahlwerke, Witten

Dipl.-Ing. Bronislava Gorr
University of Siegen
Institute of Materials Technology

Prof. Dr. K. Hack
GTT-Technologies, Herzogenrath

Dr. Å. Jansson
Thermo-Calc Software AB,
Stockholm

Prof. Dr. M. Rettenmayr
Friedrich-Schiller-University Jena
Institute of Materials Science and
Technology

Prof. Dr. R. Schmid-Fetzer
Clausthal University of Technology
Institute of Metallurgy



Seehotel Maria-Laach

General Information

The seminar takes place in the Seehotel Maria Laach situated 15 km west of Koblenz. It is overlooking the wide round of the largest Eifel maar, a volcano that has become extinct about 10000 years ago and that now forms a lovely lake surrounded by low mountains and isolated forests. Next to the Seehotel is the 900 year old monastery Maria Laach, a holy place for contemplation and meditation.

The Seehotel offers state-of-the-art teaching and learning facilities for conferences and seminars in the immediate vicinity of a healing bath with strengthening effect on everybody. Detailed information is available on the Seehotel website: www.seehotel-maria-laach.de

For further information please contact:

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<http://www.dgm.de>

Participation fee

including full accommodation:
1.650,- EURO

Fee for Members of the DGM:

Personal members or 1 non-member from a member institute/ member company: 1.550,- EURO

The fee includes:

- Attendance of the seminar sessions
- Comprehensive handouts
- Refreshments during the sessions
- Lunch and dinner
- Accommodation (2 nights)

Together with the registration, accommodation and breakfast in the Seehotel will be firmly arranged. This allows to extend communication and networking during the evenings.

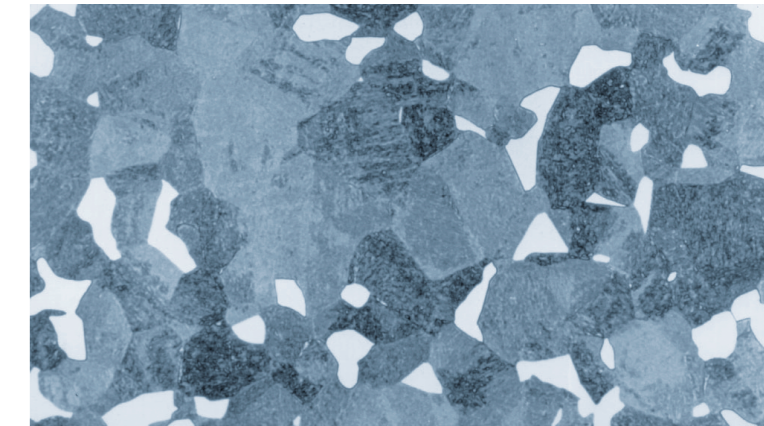
Cancellation policy:

Any cancellation is subject to a cancellation fee of 50% of the fees involved. After 15 June the entire fee is due. Substitution is possible at any time.

DGM Training Courses
and Conferences in 2011

- 06.03.-11.03. **Systematische Beurteilung technischer Schadensfälle**
- 10.03. **DFG- und AiF-Fördermittel erfolgreich einwerben**
- 15.03.-18.03. **Einführung in die Metallkunde für Ingenieure und Techniker**
- 21.03.-25.03. **Metallkunde für Ingenieure und Techniker**
- 23.03.-25.03. **Biomaterialien**
- 28.03.-29.03. **Löten - Grundlagen und Anwendungen**
- 29.03.-30.03. **Modellierung und Simulation**
- 30.03.-31.03. **Titan und Titanlegierungen**
- 04.04.-06.04. **Entstehung, Ermittlung und Bewertung von Eigenspannungen**
- 12.04.-13.04. **Schweißtechnische Problemfälle**
- 11.05.-13.05. **Werkstofffragen der Hochtemperatur-Brennstoffzelle (SOFC)**
- 17.05.-18.05. **Neue Luftfahrt-Werkstoffe**
- 19.05.-20.05. **Optimierung von Geschäftsabläufen (Workflows)**
- 23.05.-24.05. **Walzen - Planheit**
- 07.06.-08.06. **Tribologie**
- 29.06.-01.07. **Praxis der Bruch- und Oberflächenprüfung**
- 04.07.-05.07. **Grundlagen der Nanotechnologie**
- 04.07.-06.07. **Simulation of Phase Transformation**
- 06.07.-08.07. **Computer-Aided Thermodynamics**
- 18.10.-19.10. **Zellulare metallische Werkstoffe**

European Advanced Training Course

Computer-Aided
Thermodynamics

6-8 July 2011

Maria-Laach

Deutsche Gesellschaft
für Materialkunde e.V.

Max-Planck-Institut für
Eisenforschung, Düsseldorf

www.dgm.de

Wednesday

Morning: Arrival

- 13:30 G. Inden
Welcome
- 13:40 G. Inden
Computational Thermodynamics
- Reminder of thermodynamic principles
 - Data assessment / Databases / Pure Elements / Alloy systems
 - Equilibria

Presentation of different thermodynamic software

- 14:30 Å. Jansson
Software: Thermo-Calc
- Calculation of equilibria in multi-component systems

- 15:45 Coffee break

- 16:15 K. Hack, M. Rettenmayr
Software: FactSage, ChemApp, ChemSheet, SimuSage, SolKin
- Thermodynamic properties, stoichiometric reactions, complex equilibria and phase diagrams
 - The concept of local equilibrium in process simulation

- 17:30 R. Schmid-Fetzer
Software: Pandat

- 18:45 End of the 1st day

- 19:00 Dinner, informal get together

Thursday

- 8:30 C. Ernst
Application of Thermo-Calc in tool steel development
- Stable and metastable equilibria
 - Solidification according to Scheil
 - Optimisation of chemical composition
 - Optimisation of heat treatment temperatures and hot deformation processes
 - Comparison between calculation and reality (microstructures)

- 9:30 M. Rettenmayr
Computer-aided alloy and process development in the industrial practice
- Development of new amalgams for gas discharge lamps
 - Precipitation hardening in noble metal alloy systems
 - Exothermic reactions during melting of alloy components
 - Phase stability in soft solders
 - Estimation of solidification intervals

- 10:00 M. Rettenmayr
Scheil or Lever Rule? - Modeling Solidification Kinetics
- Limits of idealized models
 - Physical processes influencing concentration and phase distributions
 - Examples: microstructural parameters in binary and ternary Al-alloys

- 10:30 Coffe break

- 11:00 U. Diekmann
Practical use of JMatPro for the modelling of steel properties
- Phase transitions
 - Physical and thermo-physical properties
 - Mechanical properties

- 12:00 Lunch

Practical demonstrations

Thursday

- 13:00 K. Hack
FactSage, ChemApp, ChemSheet, SimuSage

- 14:30 G. Inden, Å. Jansson
Thermo-Calc

- 16:00 Coffee break

- 16:15 R. Schmid-Fetzer
Pandat

- 17:45 U. Diekmann
JMatPro

- 19:15 Dinner, informal get together

Friday

- 8:30 B. Gorr
Thermodynamics in the Context of High-Temperature Oxidation of conventional and newly developed alloys
- Oxidation of Ni-based superalloys
 - Nitridation of Ni-based superalloys
 - Oxidation of Co-Re model alloys
 - Advantage of the extension of FactSage data-files

- 9:30 R. Schmid-Fetzer, G. Inden, K. Hack
Calculations on demand - Real world problems raised by participants
- Participants are encouraged to present problems of their field of interest.
 - It will be tried to solve these problems in live demonstrations using the available software and databases

- 11:00 Coffee break

- 11:15 G. Inden
From equilibrium to the simulation of phase transformations (DICTRA)
- Austenite/ferrite transformation
 - Carbide precipitation
 - Slow and fast reactions
 - Competition between stable and metastable phases

- 12:15 **Short final discussion**

- 12:30 End of the seminar

Registration

Computer-Aided Thermodynamics

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European Advanced Training Course
Maria-Laach

DGM-member
 Non-member

DGM-Membership Number

Phone

Fax

E-Mail

Title, First Name(s), Name

Institute / Company

Date, Signature