

Metallurgy



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Iron Ores

Chairman:

Dr.-Ing. Hans Bodo Längen

Content:

- Crash course: Materials chemistry
- Blast furnace layout
- Resources, types and characteristics of iron ores
- Agglomeration of fines: Sintering and pelletizing
- Cokemaking and requirements on coke
- Chemical and physical processes in the blast furnace
- Application of reducing agents
- Blast furnace performance

Cokemaking

Chairman:

Peter Liszio / Viktor Stiskala



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Content:

- Production of iron and steel
- Requirements on coke for the blast furnace process
- Coal formation, mining and beneficiation
- Coal quality / Coal blending
- Coal to coke transformation / Coke quality
- Coke oven machine management
- Battery heating / Coke quenching
- Coke oven life prolongation
- Shut down principles
- Outlook – Future aspects of coke making

More information on prices and dates: info@steel-academy.com or +49 211 6707-458



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Ironmaking Basic

Chairman:

Prof. Dr.-Ing. Dieter Senk / Prof. Dr.-Ing. Peter Schmöle

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Ironmaking Advanced

Chairman:

Prof. Dr.-Ing. Dieter Senk / Prof. Dr.-Ing. Peter Schmöle

Content:

- Operational practices and challenges
- Hearth and deadman dynamics
- Modelling and simulation
- Injection of carbon-hydrogen carriers into the BF
- Various BF operation modes worldwide
- Energy network in integrated iron and steel works
- Quality and use of blast furnace slags
- Environmental protection
- Direct reduction and hydrogen-based reduction



Oxygen Steelmaking

Chairman:

Prof. Dr.-Ing. Karl-Heinz Spitzer / Dr.-Ing. Jochen Schlüter

Content:

- Design, construction and types of oxygen converters
- Thermodynamic and kinetic basics in the converter process
- Tramp elements
- Hot-Metal pretreatment
- Computational fluid dynamics in the converter
- Chemical reactions kinetics
- Mass balance and heat balance
- Converter process modelling
- Chemical compositions and qualities of iron ores
- Comparison of different converter operation practices



Hydrogen-based Reduction of Iron Ores

Chairman:

Dr.-Ing. Hans Bodo Längen / Prof. Dr.-Ing. Johannes Schenk

Content:

- CO₂-emissions and their mitigation in the steel industry
- Hydrogen - production and importance for the economic sector
- Thermodynamics and kinetics of hydrogen-based reduction
- Injection of carbon-hydrogen carriers into the blast furnace
- History, developments and processes of direct reduction
- Iron ores for hydrogen-based direct reduction
- Hydrogen-based direct reduction with Midrex, Circored, HyL/Energiron
- Hydrogen-based direct reduction for iron ore fines



Electrical Engineering of Arc Furnaces

Chairman:

Prof. Dr.-Ing. Klaus Krüger, Stahlwerk Annahütte

Content:

- Physics of furnace-arcs
- Equivalent circuit-diagram of AC-furnaces
- Short circuit and operating reactance
- Circle diagram of AC-furnaces
- Design of the high-current system for AC-furnaces
- Energy balance of the electric arc and of the furnace
- Energetic modelling of the EAF process
- Closed loop power control of AC arc furnaces
- Power supply for electric arc furnaces
- Electric principles of DC-furnaces // Comparison AC - DC



Continuous Casting of Steel

Practical and Scientific Approaches

Chairman:

Professor Dr.-Ing. Dieter Senk

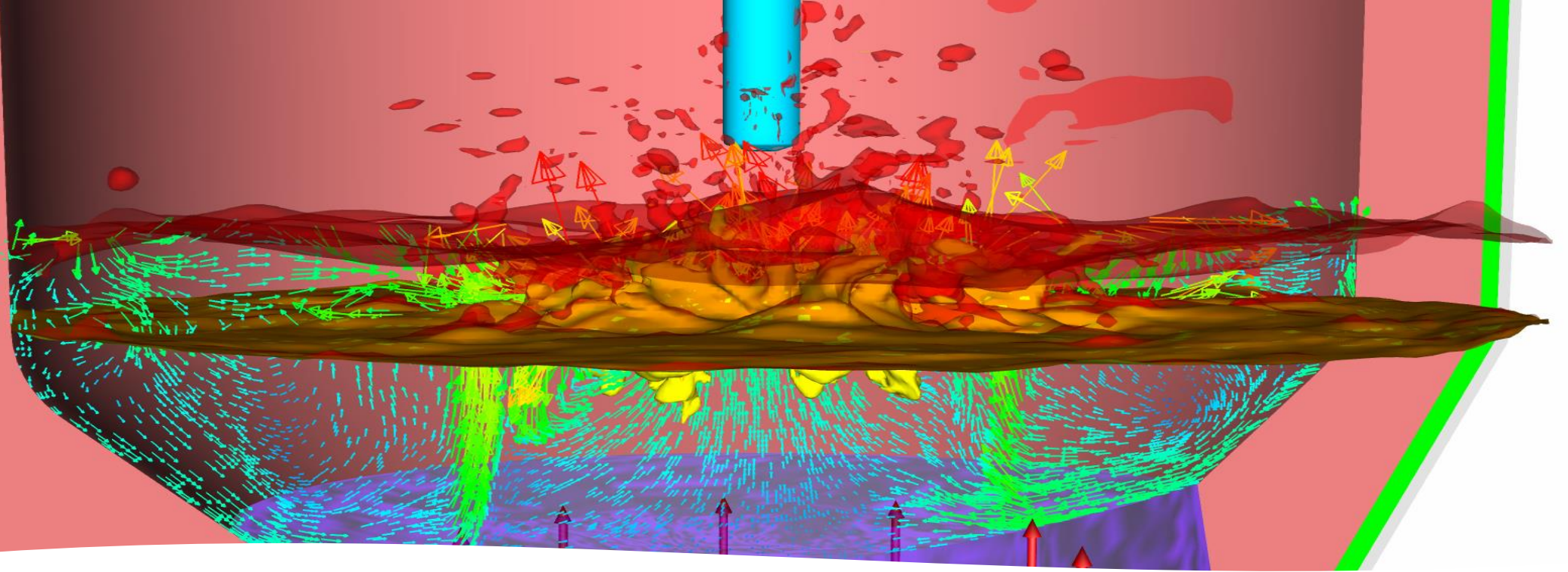


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Content:

- Fundamentals on steel solidification
- Heat transfer in continuous casting
- Cooling systems
- Shell growth
- Development of real solidification structures
- Fluid flow in mold and SEN
- Strand guiding; mechanical stress and strain
- Performance of casting flux in the mold
- Surface defects
- Coupling of casting and hot rolling

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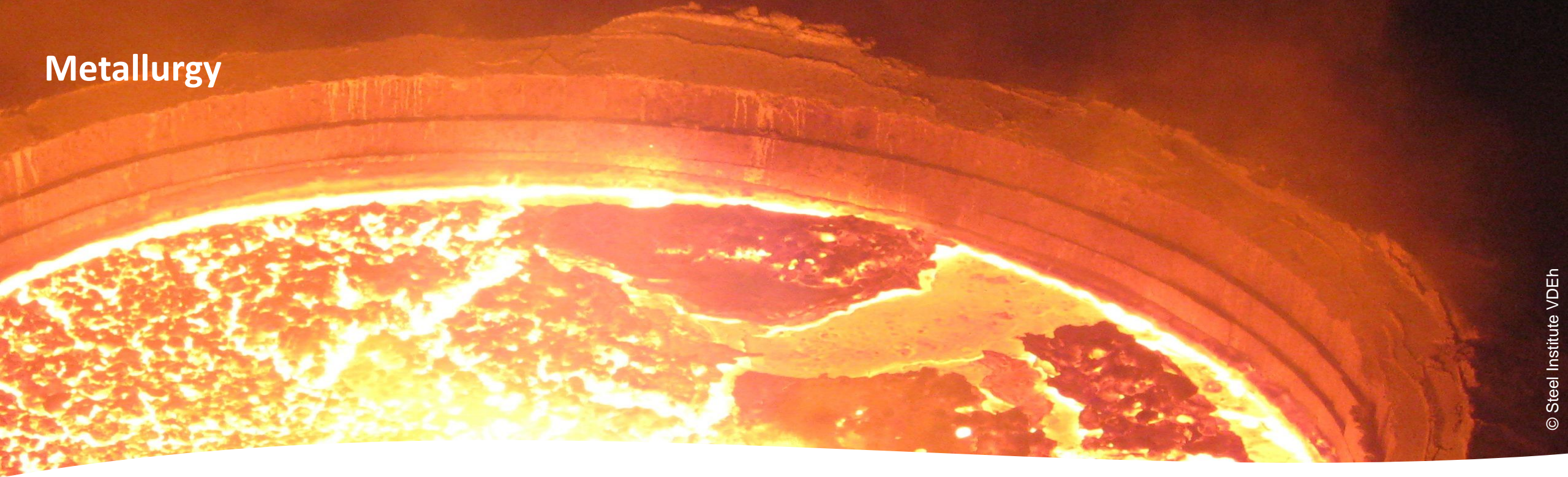
Computational Fluid Dynamics in Metallurgy

Chairman:

Prof. Dr.-Ing. Hans-Jürgen Odenthal

Content:

- CFD with respect to metallurgical applications
- Numerical methods – Equations, models, solvers
- Turbulence modelling: Fundamentals and hybrid RANS-LES
- Introduction to magneto-hydrodynamics
- Combustion modelling in CFD simulations
- Simulation of solidification multiphase flows
- Practical demonstration of Eulerian and Lagrangian
- Accuracy of CFD
- Inert gas stirring in a steel ladle – Modelling and results of a CFD benchmark



Refractory Technology

Refractory Materials and Slags in Metallurgy

Chairman:

Dr. Patrick Tassot / Dr.-Ing. Helmut Lachmund

Content:

- Basics on chemical and mineralogical composition
- Testing and evaluation
- Synthetic alumina raw material | Insulating materials | Monolithics | Lime- and dolomite products | Basic bricks
- Machines for processing and delivering
- Blast furnace process and slags
- Oxygen steel making process and slags
- Secondary metallurgy and slags
- Lime and dolomite

Refractory Technology

Applications, Wear Mechanism and Failures

Chairman:

Dr. Andreas Buhr

Content:

- Steel manufacturing process
- General overview of wear mechanisms
- Economics in refractory usage
- Failure case studies
- Refractory lining concepts of the following aggregates:
Blast furnace, tap hole and runners, oxygen blowing converter, AC and DC electric arc furnaces, steel teeming ladle, continuous casting machine

Steel Ladle Lining

Chairman:

Dr. Andreas Buhr

Content:

- Trends in clean steel technology and steel ladle lining
- Demands on refractories for secondary metallurgy
- Improvements of the steel ladle linings
- Neutral steel ladle lining for flat steel production
- Purging plugs in steel ladles – important factors for reliable performance
- Monolithic lining in a 3-converter-shop
- Basic ladle lining for flat steel production
- Flexibility of refractory lining for varying operating conditions

Stainless Steels

Chairman:

Prof. Dr.-Ing. Thomas Ladwein

Content:

- Production routes and history of stainless steels
- Basic metallurgy of stainless steels
- Duplex steels
- Standards and codes, designations
- Groups of stainless steel and their properties
- Chemical resistance of stainless steels
- Manufacturing of stainless steels
- Surface properties
- Applications of stainless steels