



2023 International Symposium on Hydrogen Metallurgy (ISHM2023)

September 5-7, 2023

Chongli, Hebei Province, China

Preliminary Technical Program

Organized by



The Chinese Society for Metals



河钢集团
HBIS GROUP

HBIS Group

Sponsored by



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Conference Website: www.ishm2023.com

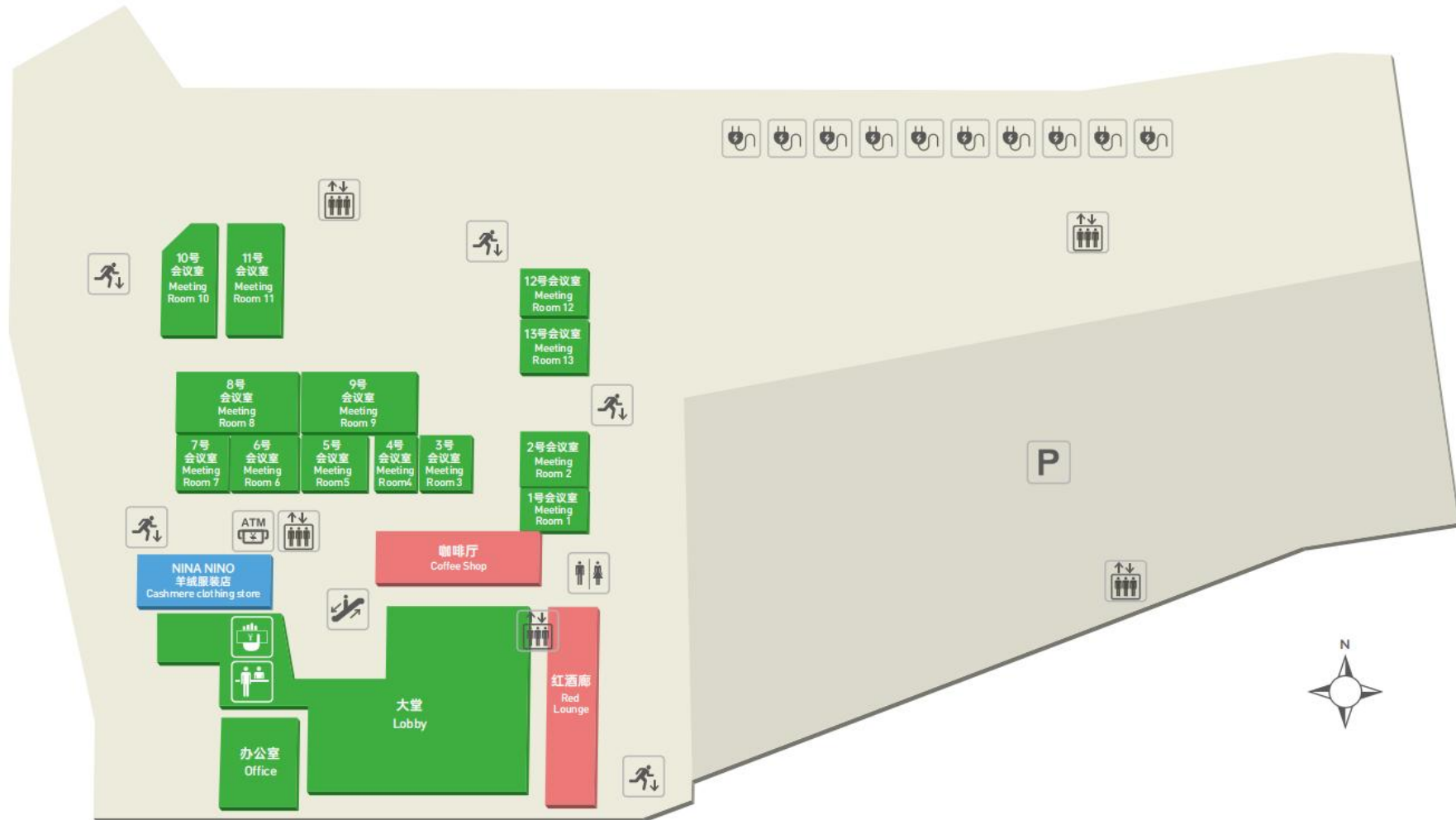
■ Technical Program Timetable

Registration	14:00-20:00, 4 Sept., Lobby (1 st Floor) of Genting Grand Hotel			
Plenary Sessions	Banquet Hall One (2 nd Floor) of Genting Grand Hotel			
08:00-09:05, 5 Sept.	Opening Address <i>Chair: Zhiling Tian</i>			
09:05-10:35, 5 Sept.	Plenary Session: P1-1 <i>Chairs: Zhiling Tian, Andrew Purvis</i>			
10:50-12:20, 5 Sept.	Plenary Session: P1-2 <i>Chairs: Jianliang Zhang, Myoung-Gyun Shin</i>			
13:30-17:45, 5 Sept.	Plenary Session: P2 <i>Chairs: Aibing Yu, Yasuo Kishimoto</i>			
08:00-12:15, 6 Sept.	Plenary Session: P3 <i>Chairs: Qingshan Zhu, Muxina Konarova</i>			
Parallel Sessions	1 st Floor of Genting Grand Hotel			
	Room 7-8	Room 9-10	Room 11-12	Room 13-14
13:30-18:00, 6 Sept.	Session A <i>Chairs:</i> <i>Deqing Zhu</i> <i>Zhengjian Liu</i>	Session B <i>Chairs:</i> <i>Jianwei Zhu</i> <i>Wen Pan</i>	Session C <i>Chairs:</i> <i>Yonglong Jin</i> <i>Kejiang Li</i>	Session D <i>Chairs:</i> <i>Hongqiang Liu</i> <i>Hui Jin</i>
Poster Session	5-6 Sept., The Lobby Area of Banquet Hall One (2 nd Floor)			
Post Technical-Visits	7 Sept., HBIS Group Zhangxuan High Tech.			

Notes:

- ◇ Presentation time for the plenary lecture is 30 minutes (including discussion).
- ◇ Presentation time for the keynote paper at parallel sessions is 25 minutes (including discussion).
- ◇ Presentation time for the contributed paper at parallel sessions is 20 minutes (including discussion).

■ Floor Map (1st Floor)



■ Floor Map (2nd Floor)



Opening Address

Time: 8:00-9:05, 5 September 2023

Room: Banquet Hall One (2nd Floor)

Chair: Zhiling Tian

- 8:00-8:10 **Opening Address-1**
Xiaogang Zhang (The Chinese Society for Metals)
- 8:10-8:20 **Opening Address-2**
Edwin Basson (World Steel Association)
- 8:20-8:30 **Opening Address-3**
Xinping Mao (University of Science and Technology Beijing)
- 8:30-8:40 Book Release Ceremony: 《Hydrogen Metallurgy Technology Development》
- 8:40-9:05 Group Photo

Plenary Session: P1-1

Time: 9:05-10:35, 5 September 2023

Room: Banquet Hall One (2nd Floor)

Chairs: Zhiling Tian, Andrew Purvis

- 9:05-9:35 **Thinking of Transformation and Upgrading of Chinese Steel Production in the Face of Carbon Neutrality**
Tao Jiang (Central South University, China)
- 9:35-10:05 **Green and Low-carbon Development Strategy and Innovative Practice of HBIS Group**
Yiren Li (HBIS Group, China)
- 10:05-10:35 **Update on the Development of Hydrogen-Based Ironmaking Process at POSCO**
Myoung-Gyun Shin (POSCO, Korea)
- 10:35-10:50 Coffee Break

Plenary Session: P1-2

Time: 10:50-12:20, 5 September 2023

Room: Banquet Hall One (2nd Floor)

Chairs: Jianliang Zhang, Myoung-Gyun Shin

10:50-11:20 **Modelling and Analysis of Hydrogen Blast Furnace**

Aibing Yu (Monash University, Australia)

11:20-11:50 **Hydrogen: A Key Element in Transforming the Steel Sector**

Andrew Purvis (World Steel Association)

11:50-12:20 **JFE Steel's Initiatives toward Carbon Neutrality**

Yasuo Kishimoto (JFE, Japan)

Plenary Session: P2

Time: 13:30-17:45, 5 September 2023

Room: Banquet Hall One (2nd Floor)

Chairs: Aibing Yu, Yasuo Kishimoto

13:30-14:00 **Progress and Prospect of Low-carbon Ironmaking Technology and Hydrogen Metallurgy Process**

Jianliang Zhang (University of Science and Technology Beijing, China)

14:00-14:30 **Green and Low-carbon Hydrogen Metallurgy Technology Innovation and Engineering Practice for Carbon Neutrality**

Zhilong Zhao (CERI, China)

14:30-15:00 **Key Technical Challenges of Hydrogen Shaft Furnace Ironmaking and the Countermeasures**

Geoff Wang (University of Queensland, Australia)

15:00-15:30 **The Transition to a Sustainable Steel Industry with The ENERGIRON Direct Reduction Technology**

Stefano MAGGIOLINO (Tenova HYL, Mexico)

15:30-15:45 Coffee Break

15:45-16:15 **Basic Theoretical Research on Hydrogen Metallurgy**

Xionggang Lu (Shanghai University, China)

16:15-16:45 **Transformation to Fossil Free Steel with the HYBRIT Technology (*online*)**

Martin Pei (SSAB AB, Sweden)

16:45-17:15 **Technological Pathways and Process Routes towards CO₂-free Production** (*online*)

Johannes Schenk (Montanuniversitaet Leoben, Austria)

17:15-17:45 **Ways and Projects to Climate Neutral Iron and Steelmaking in Europe** (*online*)

Hans Bodo Lungen (VDEh Institute, Germany)

Plenary Session: P3

Time: 8:00-12:15, 6 September 2023

Room: Banquet Hall One (2nd Floor)

Chairs: Qingshan Zhu, Muxina Konarova

8:00-8:30 **Fluidized Bed Hydrogen Direct Reduction: History And Perspective**

Qingshan Zhu (Institute of Process Engineering, Chinese Academy of Sciences, China)

8:30-9:00 **Enabling Hydrogen Storage and Transport: Unleashing Cost Effective Potential through Liquid Organic Hydrogen Carriers**

Muxina Konarova (University of Queensland, Australia)

9:00-9:30 **Decarbonization to a Green End State: Bhp Billiton's Steel Decarbonization Plan**

Nigel Tame (BHP, Australia)

9:30-10:00 **Recent Work of Hydrogen Blast Furnace Ironmaking: from Numerical Analysis to Industry Applications**

Yansong Shen (University of New South Wales, Australia)

10:00-10:15 Coffee Break

10:15-10:45 **Reduction Behaviour of Hydrogen with FeO in Synthetic Molten HIsarna Slag**

Zushu Li (The University of Warwick, United Kingdom)

10:45-11:15 **Technological Approach to Carbon Neutrality in Korea's Steel Industry**(*online*)

Dong Joon Min (Yonsei University, Korea)

11:15-11:45 **Analysis and Optimization of Hydrogen-based Shaft Furnace Smelting Process**

Mansheng Chu (Northeastern University, China)

11:45-12:15 **Clean, Low-Carbon and Efficient Integrated Hydrogen Production And Hydrogen Metallurgy Technology**

Hui Jin (Xi'an Jiaotong University, China)

Parallel Session: A

Time: 13:30-17:45, 6 September 2023

Room: Room 7-8

Chairs: Deqing Zhu, Zhengjian Liu

13:30-13:55 **Keynote Green Transformation, Low-Carbon Development-Innovative Practice of HYMEX™ (1.2 Million Tons of Hydrogen Metallurgical Engineering Demonstration) in HBIS Group**

Aijun Zheng (HBIS Group Zhangxuan Technology, China)

13:55-14:20 **Keynote Impact of Basicity on Hydrogen-Rich Gas-Based Direct Reduction of Fired Pellets**

Deqing Zhu (Central South University, China)

14:20-14:45 **Keynote A Fundamental Study of the Carburization of DRI by CH₄/CO**

Zhengjian Liu (University of Science and Technology Beijing, China)

14:45-15:05 **A Pragmatic Multipronged Approach to Sustainability at Tenova**

Paolo Argenta (Tenova, Upstream Business Unit, Italy)

15:05-15:25 **Digital Technology Research on Hydrogen-based DRI**

Yingjian Xue (CERI, China)

15:25-15:45 **H2 Reduction and Carbidization of Fe₂O₃ with Pure CH₄**
Alberto Conejo (University of Science and Technology Beijing, China)

15:45-15:55 Coffee Break

15:55-16:20 **Keynote Study on Hydrogen-Rich Gas-Based Direct Reduction of Oxide Pellets Made by Magnetite Concentrate**
Jian Pan (Central South University, China)

16:20-16:45 **Keynote A Review on Modelling and Simulation on Shaft Furnace Hydrogen Metallurgy**
Ning Yang (Institute of Process Engineering, Chinese Academy of Sciences, China)

16:45-17:05 **Performance Analysis of the First Month Operation of the COG Basis Direct Reduction Plant in HBZX**
Kaiwei Qin (HBIS Group Zhangxuan Tech., China)

17:05-17:25 **Study on EAF Steelmaking Technology by Using Hydrogen-based Direct Reduced Iron**
Hongtao Pan (CERI, China)

17:25-17:45 **CFD-DEM Modelling for the Gas-Particle Flow Behavior Under Charging Process In Hydrogen-Rich Injection Shaft Furnace**
Yinxuan Qiu (University of Queensland, Australia)

Parallel Session: B

Time: 13:30-17:45, 6 September 2023

Room: Room 9-10

Chairs: Jianwei Zhu, Wen Pan

13:30-13:55 **Keynote Research on Hydrocarbon Coupling Metallurgical Technology in Blast Furnace Ironmaking**
Fuming Zhang (Shougang Group Co., Ltd. China)

13:55-14:15 **The Influence of Hydrogen and Carbon Monoxide Interaction on Reduction, Carbon Evolution and Sulfur Transition Reaction In**

Hydrogen-Rich Blast Furnace

Jian Xu (Chongqing University, China)

14:15-14:35 **A Novel Process of Low-Carbon Ironmaking with Pure-Oxygen and Hydrogen-Rich in Reduction & Smelting Furnace Based on Long Process**

Xing Han (HBIS Material Technology Research Institute, China)

14:35-14:55 **H₂ Utilisation In an Ironmaking Blast Furnace with Top Gas Recycling and CO₂ Electrolysis**

Yichao Hu (University of Queensland, Australia)

14:55-15:15 **Hydrogen Rich Injection Operation and Engineering Practice in Steel Enterprises with Long Process Flow**

Qichen Hu (CERI, China)

15:15-15:35 **CFD Study of Injection Operation for Hydrogen-Bearing Materials in an Ironmaking Blast Furnace**

Ziguang Zhao (University of New South Wales, Australia)

15:35-15:45 Coffee Break

15:45-16:05 **Industrial Experiment and Analysis of Hydrogen-rich Gas Injection in Blast Furnace in Ansteel**

Wei Zhang (Ansteel Iron & Steel Research Institutes, China)

16:05-16:25 **Analysis and Comparison of Energy Saving and Emission Reduction of Blast Furnace Injection with Different Hydrogen-rich methods**

Yana Qie (North China University of Science and Technology, China)

16:25-16:45 **The effect of COG injection on the raceway**

Peng Li (WISDRI Engineering & Research Incorporation Limited, China)

16:45-17:05 **A Novel Technology of Co-Injecting Hydrogen and Biomass in Blast Furnaces for a Sustainable Carbon-Neutral Ironmaking: Concept and Preliminary CFD study**

Ming Jiang Gan (University of New South Wales, Australia)

17:05-17:25 **Mathematical Model and Industrial Validation of Blast Furnace Ironmaking with Injecting Hydrogen Through Tuyeres**

Jiameng Lei (Wuhan University of Science and Technology, China)

17:25-17:45 **Simulation of the Effects of Hydrogen Injection on the Main Indicators of Blast Furnace and Carbon Dioxide Emission Reduction by Zero-Dimensional Model**

Guohai Zhu (Air Liquide (China) R&D Co., Ltd. China)

Parallel Session: C

Time: 13:30-18:00, 6 September 2023

Room: Room 11-12

Chairs: Yonglong Jin, Kejiang Li

13:30-13:55 **Keynote Progress in Theoretical Research and Technological Development of Hydrogen Reduction Processes by CISRI**

Peimin Guo (China Iron & Steel Research Institute Group Co., Ltd., China)

13:55-14:20 **Keynote Several key issues worth being deeply explored in the common difficult technologies of hydrogen metallurgy process**

Yonglong Jin (HBIS, China)

14:20-14:40 **Global Decarbonization Approaches - Vale's Contribution & Shared Challenges**

Dauter Oliveira (Vale, Brazil)

14:40-15:05 **Keynote Progress and Prospect of Energy Technology in Low Carbon Metallurgy Process**

Wentao Rao (Baowu Clean Energy Co., Ltd., China)

15:05-15:25 **Numerical study of the direct reduction of single pellets in the HITECOM reactor**

Fengbo An (TU Bergakademie Freiberg, Germany)

15:25-15:45 **Fundamental and Industrialized Research on Hydrogen-Based Flash Ironmaking Technology**

Lei Guo (University of Science and Technology Beijing, China)

15:45-15:55 Coffee Break

15:55-16:15 **Key Technologies for Producing High Purity And High Value Iron-Based Materials by The Hydrogen Reduction Method**

Min Gan (Central South University, China)

16:15-16:40 **Keynote Fundamental science for hydrogen ironmaking: understanding hydrogen reduction at atomistic scale**

Kejiang Li (University of Science and Technology Beijing, China)

16:40-17:00 **Microstructural evolution of wüstite after reacting with H₂ and CO-CO₂ at low temperature**

Qiaoyu Zheng (Wuhan University of Science and Technology, China)

17:00-17:20 **A Study on the Kinetics and Reduction Properties of Ammonia Directly Reducing Iron Ores**

Yuejun Liu (University of Science and Technology Liaoning, China)

17:20-17:40 **The reduction of ilmenite under H₂ atmosphere: advantages of fluidized bed of pre-oxidized ilmenite**

Jiehan Zhang (University of Science & Technology Beijing, China)

17:40-18:00 **Design and Implementation of Safety Instrumented System (SIS) for Hydrogen Based Reduction Shaft Furnace Factory**

Quangang Li (HBIS Group Zhangxuan Technology, China)

Parallel Session: D

Time: 13:30-17:20, 6 September 2023

Room: Room 13-14

Chairs: Hongqiang Liu, Hui Jin

13:30-13:55 **Keynote Theoretical Study of Controlling Carbon Deposition of Hydrogen-Rich Reducing Gases**

Fengman Shen (Northeastern University, China)

13:55-14:20 **Keynote The Planning and Operation for Large Scale Utilization of Green Hydrogen in Hydrogenation Metallurgy: Take Baowu Steel Group for Example**

Yiwei Wu (Baowu Clean Energy Company, China)

14:20-14:40 **Analysis of Large Scale Hydrogen Production Technology and Its Impact on Cost of Hydrogen Metallurgy**

Jinzhe Liu (HBIS Group Strategic Research Institute, China)

14:40-15:00 **Low Cost Green Hydrogen Preparation Technology for Metallurgical Industry**

Li Li (Northeastern University, China)

15:00-15:20 **Production and Application of Low Cost Green Hydrogen**

Hongchao Ji (HBIS Industrial Technology Service Co.,Ltd. China)

15:20-15:40 **Computational materials design contributing to sustainable metallurgy (online)**

Wangzhong Mu (KTH Royal Institute of Technology, Sweden)

15:40-15:50 Coffee Break

15:50-16:15 **Keynote Grey Hydrogen: How the Ghg Emission In the Iron and Steelmaking Production Can be Reduced by Using Waste (online)**

Paulo Santos Assis (UFOP: Federal University of Ouro Preto, Brazil)

16:15-16:40 **Keynote Basic Science Behind Sustainable Metallurgy (online)**

Yan Ma (Max-Planck-Institut für Eisenforschung GmbH, Germany)

16:40-17:00 **Numerical Simulation of the Service Process of Hydrogen-Based Shaft Furnace Lining Refractory**

Jingwen Cui (Zhengzhou University, China)

17:00-17:20 **From the Aspect of Process Detection and Control, the Key Means to Improve the Safety and Efficiency of Hydrogen in Metallurgical Processes are Discussed**

Wanhe Gao (HBIS Group Zhangxuan Tech., China)

Poster Session

Time: 5-6 September 2023

Room: The Lobby Area of Banquet Hall One (2nd Floor)

CFD Study of Injection Operation for Hydrogen-Bearing Materials in an Ironmaking Blast

Ziguang Zhao (University of New South Wales, Australia)

A Novel Technology of Co-Injecting Hydrogen and Biomass In Blast Furnaces for a Sustainable Carbon-Neutral Ironmaking: Concept and Preliminary CFD Study

Ming Jiang Gan (University of New South Wales, Australia)

Effects of Grain Sintering on Pellets Reduction Performance in Hydrogen-Rich Shaft Furnaces

Yang Fei (Institute of Process Engineering, Chinese Academy of Sciences, China)

Modeling and Analysis of the Hydrogen Reduction of Magnetite in the Flash Ironmaking Process

Jiayi Wang (Institute of Process Engineering, Chinese Academy of Sciences, China)

Energy and Exergy Analysis of a Fluidized Bed Hydrogen Direct Reduction Iron System

Linwei Wang (University of Science and Technology Beijing, China)

EAF Steelmaking with Hydrogen based Direct Reduced Iron: Challenges and Reflections

Botao Xue (University of Science and Technology Beijing, China)

Process Optimization of Pellet Production for Hydrogen-Based Shaft Furnace

Jianhua Liu (HBIS Group Zhangxuan Tech., China)

Digital Twins Technology and Its Applications in Hydrogen Energy Development Engineering

Qi Wang (HBIS Group Zhangxuan Tech., China)

Research and Application of Automatic Control System for Hydrogen Metallurgy Torch Release

Tao Wang (HBIS Group Zhangxuan Tech., China)

Study on CO₂ Capture Technology In Waste Gas From Hydrogen Based Direct Reduction

Yanfeng Liu (HBIS Group Zhangxuan Tech., China)

Discussion on the Prospect of Developing Coke Oven Gas Direct Reduction Technology in China

Yanfeng Liu (HBIS Group Zhangxuan Tech., China)

The System of CO₂ Capture System in DR shafts Complex Control Technologies Design and Implementation

Guangchun Hao (HBIS Group Zhangxuan Tech., China)

Innovation and Design Characteristics of Hydrogen Metallurgy Demonstration Project of Zhang Xuan Technology

Peng Lu (HBIS Group Zhangxuan Tech., China)

Application of Cascade Control Based on Deltav System in Hydrogen Metallurgy Engineering

Xiaofei Wang (HBIS Group Zhangxuan Tech., China)

Feasibility Study on Utilizing Pmc Ore Based Pellets In Hydrogen Reduction Shaft Furnace

Xing Han (HBIS Material Technology Research Institute, China)

Production practice of COG DRP in ZXHT start up

Peng Lu (HBIS Group Zhangxuan Tech., China)

Modeling and simulation of the direct reduction process for pellets in mixed reducing gas of H₂-CO

Yujie Zhang (Northeastern University, China)