CUUTE

Program

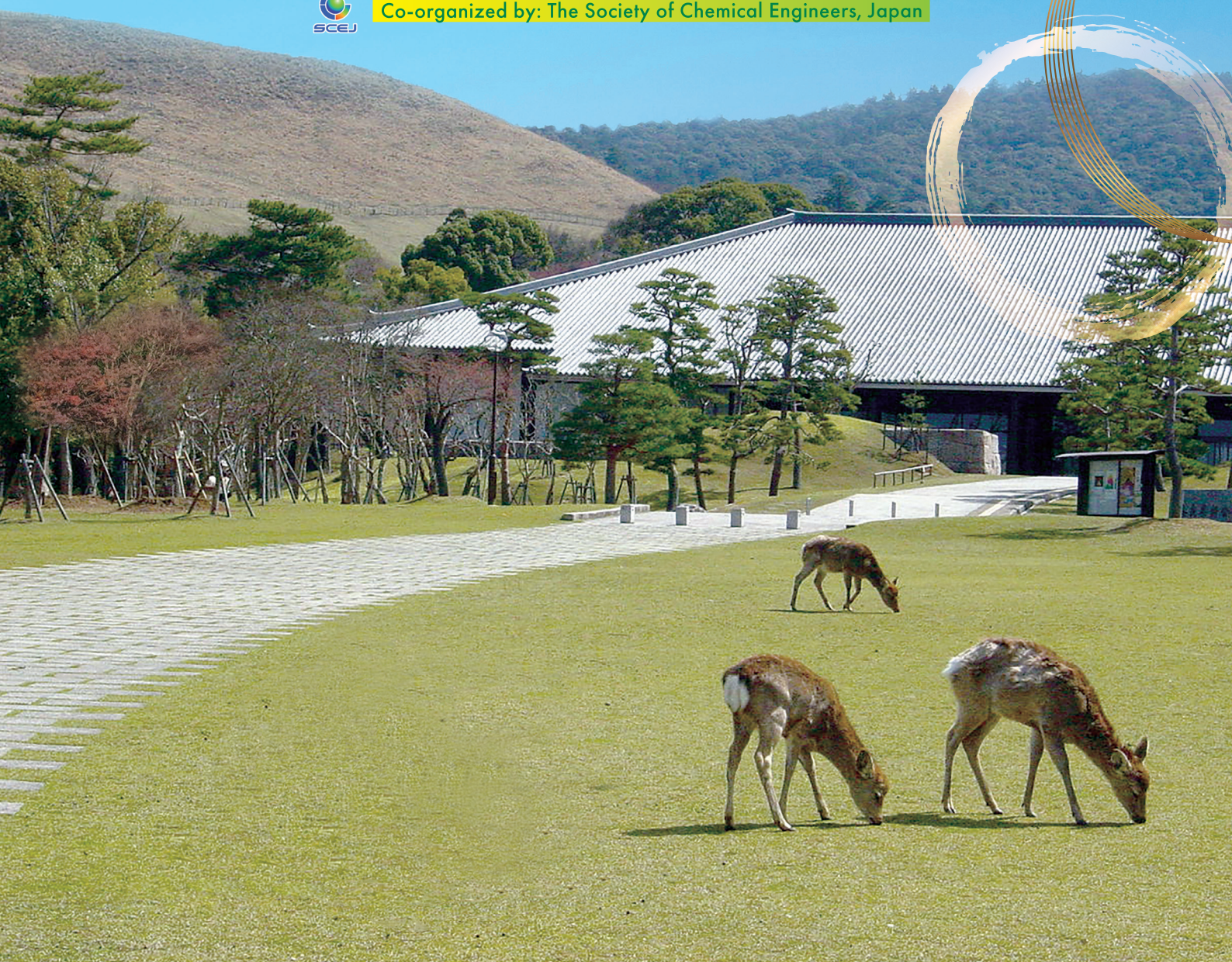
CUUTE-2

The Second Symposium on Carbon Ultimate Utilization Technologies for the Global Environment

Date:Tue 12- Fri 15, November, 2024
Venue:Nara Kasugano International Forum
URL:https://cuute2.com/

Organized by: The Iron and Steel Institute of Japan,ISIJ

Co-organized by: The Society of Chemical Engineers, Japan



Welcome to CUUTE-2

On behalf of the symposium, it is my great pleasure to introduce you to the Second Symposium on Carbon Ultimate Utilization Technologies for the Global Environment (CUUTE-2), Nara, Japan, on 12th -15th November 2024.

The major themes of this conference will be ultimate carbon utilization and the establishment of carbon-neutral industries and society. Since the first symposium (CUUTE-1) was successfully convened in 2021, the social trend has drastically accelerated toward carbon neutrality from the mitigation of CO_2 emissions. As the UN Intergovernmental Panel on Climate Change (IPCC) considers carbon dioxide (CO_2) emissions as the greatest contributor to global warming, it is indispensable to avoid the emission of CO_2 to the environment. Carbon, however, is an essential element for various materials, has high exergy, and has a wide variety of chemical and physical functions on the material properties. It is difficult to eliminate the use of carbon in our social and industrial activities. Therefore, it is necessary to establish the technologies for the ultimate use of carbon that will ultimately effectively utilize carbon, reduce its usage, and reduce CO_2 emissions down to the level at which carbon neutrality can be achieved.

The modern steel industry and other manufacturing sectors have achieved high energy savings and reduced CO_2 emissions. However, further challenges are required to further reduce carbon according to the demands of the times. This conference is organized to seek pathways for the ultimate utilization of carbon resources in the iron and steel industry and manufacturing industries to still have harmony with the global environment. Topics include utilization technology of carbon resources in iron and steel, chemical and manufacturing industries, CO_2 recovery, CO_2 utilization for the production of carbon materials, and industrial utilization of carbon materials. Also, include hydrogen, ammonia and energy carriers use for low-carbon industry establishment, and energy system assessment and life cycle assessment integrating the entire processes.

CUUTE-2 intends to gather domestic and international knowledge for the development of new low-carbon technologies and low-carbon processes. This conference will showcase innovation and technology, provide details of the latest industrial solutions to carbon utilization issues, and will demonstrate how industries and researchers are meeting the many challenges related to the issues.

I heartily welcome your participation in CUUTE-2 in the beautiful Autumn of Nara the Japanese old capital having 1300 years of history.

Hiroshi Nogami,
Chair of CUUTE-2, Tohoku University

Organizing Committee/Executive Committee/ International Scientific Committee

Organizers

Organized by The Iron and Steel Institute of Japan

Co-Organized by The Society of Chemical Engineers, Japan

Sponsored by ・The Consortium for Scientific and Engineering Research on Ironmaking Processes

・Hyuga Memorial Grant for International Conference

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Conference Advisor, Founding Chairman

KATO, Yukitaka (Institute of Science Tokyo)

Conference Co-Chair

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MURAKAMI, Hideki (NIPPON STEEL CORPORATION)

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KISHIMOTO, Yasuo (JFE Steel Corporation)

MATSUKATA, Masahiko (Waseda University)

YAMAJI, Kenji (Research Institute of Innovative Technology for the Earth, RITE)

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KISHIMOTO, Yasuo (JFE Steel Corporation)
NOMURA, Seiji (NIPPON STEEL CORPORATION)
ROMEO, Luis M. (University of Zaragoza)
SON, Sanghan (POSCO)
YANG, Yongxiang (TU Delft)

Corporating Organizations & Companies

Architectural Institute of Japan
The Chinese Society for Metals (CSM), China
Japan Association of Corrosion Control
The Japan Bridge Association
The Japan Institute of Energy
The Japan Research and development Center for Metals
Japan Society of Civil Engineers
The Japan Society of Mechanical Engineers (JSME)
Japanese Society of Steel Construction
The Mining and Materials Processing Institute of Japan
Society of Environmental Science, Japan

Plenary Speakers

A novel closed-carbon-loop technology based on in process carbon dioxide splitting for decarbonsing energy-and-carbon-intensive industry

Prof. Yulong Ding
University of Birmingham

Prof. Yulong Ding is the founding Chamberlain Chair of Chemical Engineering at the University of Birmingham and director of Birmingham Centre for Energy Storage. His research covers liquid air storage, latent heat storage, chemical heat storage, and thermochemical closed carbon looping. His h-index is over 90 (Google Scholar) A novel closed-carbon-loop technology will be reported.

Strategies and Challenges for the Global Steel Industry to Achieve Carbon Neutrality

Prof. Takeo Hoshino
The University of Tokyo

Former Deputy Director-General in charge of International Resources, Energy Strategy, and Industrial Technology Policy of the Ministry of Economy, Trade and Industry. Appointed Leader of ISIJ committee of carbon neutral iron & steelmaking. He develops methods for quantitatively analyzing resource efficiency and environmental impact of base metal materials, considering their entire life cycle from production to use, recycling, and disposal after use, using objective evaluation indicators, and exploring optimal solutions for material use. The progress of public and private sector strategies to achieve carbon neutrality in the steel industry, domestically and internationally, and the challenges faced will be presented.

The Challenge of Japanese Steel Industry to achieve Carbon Neutrality

Dr. Seiji Nomura
Nippon Steel Corporation

Dr. Seiji Nomura is the project leader of the Green Innovation in Steelmaking (GREINS), the Green Innovation Fund Project of “Hydrogen Utilization in Iron and Steelmaking Processes” in Japan, and the Head of Process Research Laboratory at Nippon Steel Corporation. He has made remarkable achievements in the field of ironmaking, particularly in research related to coal and coke. He is set to report on the progress and future prospects of achieving a low-carbon society in the Japanese steel industry.

Climate Change and the Global Steel Industry

Mr. Andrew Purvis
Director Sustainable Manufacturing at World Steel Association

Mr. Andy Purvis leads industry association with a strong focus on sustainability at the World Steel Association. In his role Mr. Purvis leads world steel programmes relating to Environment, Safety, Technology and Industry and Product Sustainability. Mr. Purvis has worked in and around the steel industry for almost 30 years in roles increasing focused on environmental performance, sustainability and greenhouse gas abatement technology and policy. He will mention about relationship between climate change and the global steel industry based on his wonderful special knowledge.

Update on the development of POSCO's hydrogen-based ironmaking process, HyREX

Dr. Myoung-Gyun Shin
Low-Carbon Iron and Steel making R&D Center, POSCO

Dr. Myung-Gyun Shin is Head of Low Carbon Iron & Steel Making R&D Center of the POSCO, Republic of Korea. He has great achievement in new process development and commercialization of FINEX. He will give a lecture on the recent development of HyREX which is the hydrogen ironmaking technology using fluidized bed reactor.

The Northern Lights project

Mr. Fredric Spiegel
Technical Director in the Tokyo office, Equinor

As for implementing CCS, Norway is one of the most experienced countries in the world. Equinor is a leading company of CCS and is investing in the Northern Lights project that stores CO_2 storage on the Norwegian continental shelf near Bergen as a part of the Longship Project. Mr. Fredric Spiegel, the Technical Director in the Tokyo office of Equinor, will introduce the entire picture of this big project and present the latest report on it.

Development of a New Pattern of Low-carbon Green Ironmaking In China

Prof. Jianliang Zhang
University of Science and Technology Beijing

Prof. Jianliang Zhang is a professor at University of Science and Technology Beijing and has outstanding achievements in a wide range of fields including ironmaking, environmental-friendly metallurgy, complex ferroalloys. He also serves as vice-chairman of the key section of The Chinese Society of Metals. He will talk about current state of Chinese steel industries, world biggest steel producer, and its future prospects for sustainable steel production.

General Information

Conference Date

Tue 12 - Fri 15 November, 2024

Conference Venue

Nara Kasugano International Forum 甍 IRAKA

101 Kasugano-cho, Nara, 630-8212, JAPAN +81- 742-27-2630

Conference Program

Day	Morning	Afternoon	Evening
Tue 12 November, 2024		16:00 - Registration	17:30 – Welcome Reception
Wed 13 November, 2024	09:30 - 09:40 Opening 09:40 - 12:20 Technical Session	12:20 - 13:50 Poster Session 13:50 - 17:50 Technical Session	
Thu 14 November, 2024	09:00 - 12:00 Technical Session	13:00 - 14:50 Technical Session 14:50 - Photo Session / Refresh Walk	19:00 – Banquet at Nara Hotel
Fri 15 November, 2024	09:00 - 12:30 Technical Session	12:30 - 12:40 Closing	

Official Receipt

The receipt is available from “My Page” by logging in to the registration system with the ID and password you created during the registration process.

Onsite Information

The registration desk will be set up at the Entrance Hall.

12 Nov. 16:00 -

13 Nov. 09:00 -

14 Nov. 08:45 -

15 Nov. 08:45 -

Lunch

13 Nov. 12:20 – 13:50

14 Nov. 12:00 – 13:00

Lunch boxes will be provided on-site to those who applied and paid for them during the registration process on November 13 and November 14.

Refreshment

Drinks will be available in front of Room A, Main Hall (Noh theather 1F).

*No eating and drinking in Room A, Main Hall (Noh theather 1F).

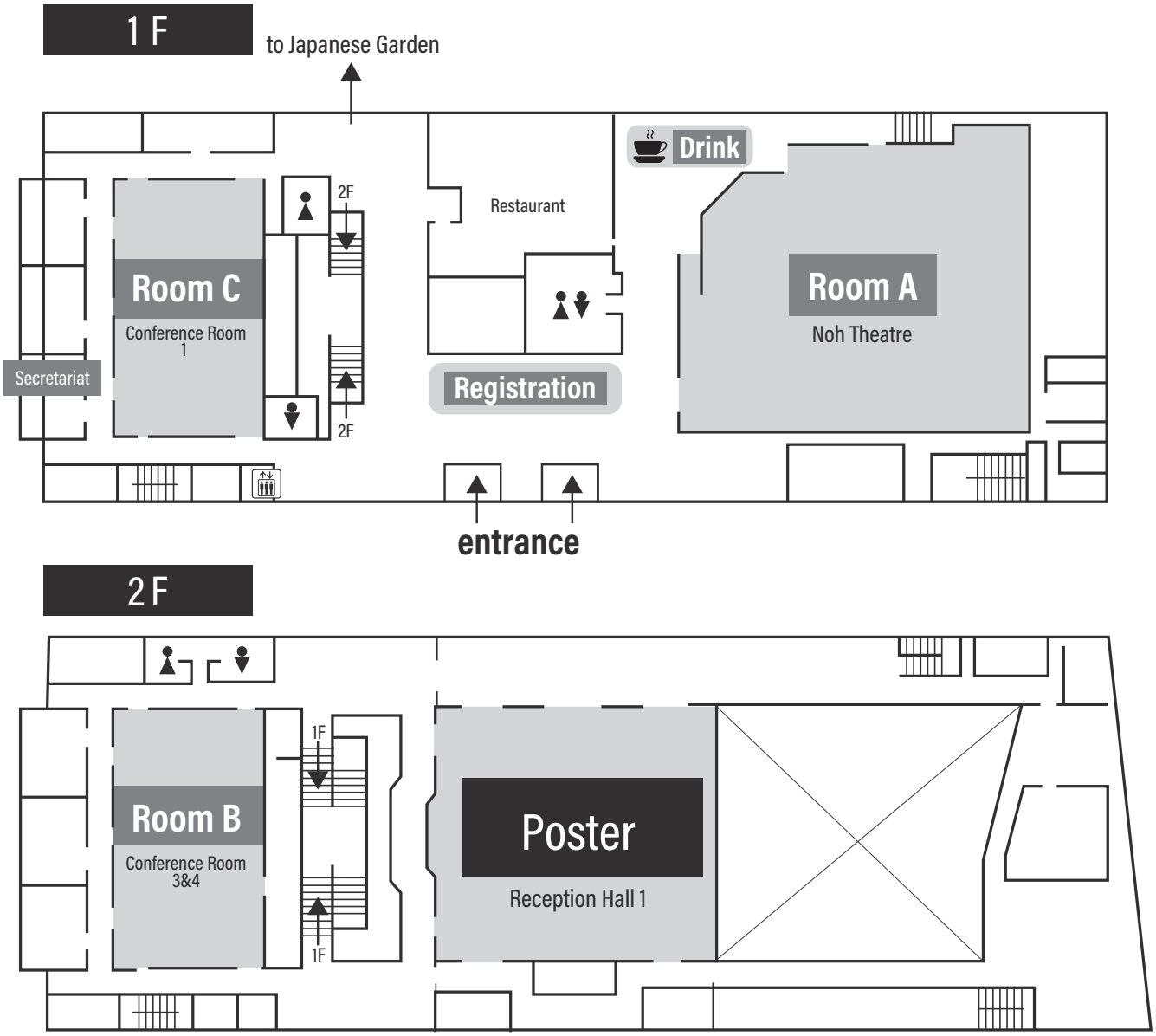
Wi-Fi

We are pleased to offer you free Wi-Fi throughout the venue.

Information will be posted on-site.

Floor Map

Nara Kasugano International Forum 甍 IRAKA



Guidelines for Oral Presenters

Please use your own PC for the presentation and connect it to the projector.
It is also available to prepare the data in a USB or to copy your presentation file to the PC equipped in each session room. To be projected suitably at the session room, please prepare the slides in the ratio of either 16:9 or 4:3. Since the official language is English, please prepare your slides in English.

Time Schedule

	Total Presentation Time	Presentation time	Discussion time
Plenary Lecture	40 min.	35 min.	5 min.
Keynote Lecture	30 min.	25 min.	5 min.
Regular	20 min.	15 min.	5 min.

BELL --- First Warning (3 min. before) / Second: End of speech / Third: End of discussion.

Audio-Visual Equipment

The following equipment is available in each session room during CUUTE-2:

- LCD projector

  The connection is basically HDMI; Mac users without an HDMI port are requested to bring their own HDMI converter if possible.

- PC (laptop, Windows 10 or 11) with the latest PowerPoint and Adobe Reader DC (PDF)

  It is the presenter's responsibility to copy the presentation file onto the provided PC during any break prior to their session. The file must be compatible with Microsoft PowerPoint or Adobe Acrobat on the Windows systems mentioned above.

- Projection laser pointer

Data Check for Plenary Speakers

Technical Staff will check your data. Please kindly come to the PC operator's desk located by Door 4 at the back of Room A, Main Hall, (Noh theater) at least 15 minutes before your plenary session starts.

Oral Session procedure

- Please be seated in the "Next Speaker's Seat" (located in the first row of each room) at least 10 minutes prior to your presentation.
- Please follow the chairperson's instructions.
- Please check the time allocated for your presentation and finish your presentation within the designated time.

Guidelines for Poster Presenters

Wednesday, November 13 from 12:20 to 13:50. at the reception hall, 2F.

Size of a poster board: 1,200mm wide and 2,100mm high.
The core time is scheduled from 12:45 to 13:45, and presenters are requested to stay by their posters during this period.

Only after 11:00 A.M. on November 13, you can put your poster on the board identifying labels with presentation numbers (e.g. P-01) before the session starts. Push pins are available on the spot. After the session, you are requested to remove your poster. Please note that after 16:00 (after the afternoon break). all remaining posters will be removed accordingly.

Please clearly display the paper title, author names and affiliations on the poster.
For poster presenters from overseas: Posters should be printed by yourself before the departure from your country.

General

- The copyright of the presentation materials (content) belongs to the presenter. Therefore, if the presentation materials cause any issues related to the infringement of third-party rights or interests, the presenter will be fully responsible.

Emergency Contact:

Email: cuute-2@or.knt.co.jp

Guidelines for Chairpersons

In order to operate the session smoothly, chairpersons are required to confirm the following:

Presentation Time

Plenary lecture: 40 minutes (35 minutes for presentation and 5 minutes for Q&A).
Keynote lecture: 30 minutes (25 minutes for presentation and 5 minutes for Q&A).
Oral presentation: 20 minutes (15 minutes for presentation and 5 minutes for Q&A).

Before the session

- Chairpersons are requested to enter the session room 15 minutes before the session starts.
- Please check the attendance of presenters of the session. They are requested to enter the session room 10 minutes before the start of the session, while plenary speakers are requested to arrive 15 minutes beforehand.

During the session

- In case a presenter does not appear by the time of their presentation. The chairperson shall announce the cancellation and that the next presentation will start on schedule.
- Please inform the audience of the following items when the session starts.
  - Chairperson's name and affiliation.
  - Either video or audio recording of the session, including taking photos, is prohibited.
  - The time allotment for each presentation.
  - People asking questions or making comments should introduce themselves before their questions or comments.
  - Please introduce the name and organization of the speaker and the title of the paper before each presentation.
- The chairperson is expected to moderate discussions and manage time during the session.
- At the end of the session, the chairperson might be asked to make a few administrative announcements.

Please ask the symposium staff if you have any questions.

Thank you for your cooperation.

Emergency Contact:

Email: cuute-2@or.knt.co.jp

CUUTE-2 Programme at a Glance

	Tue. 12 Nov	Wed. 13 Nov			Thu. 14 Nov			Fri. 15 Nov		
	Entrance Hall/ Garden	Room A	Room B	Room C	Room A	Room B	Room C	Room A	Room B	Room C
9:00										
9:30					9:00-9:40 [PL3] Plenary Lecture Prof. Yulong Ding			9:00-9:40 [PL6] Plenary Lecture Dr. Myoung-Gyun Shin		
10:00		Opening 09:40-10:20 [PL1] Plenary Lecture Dr. Seiji Nomura			9:40-10:20 [PL4] Plenary Lecture Mr. Andrew Purvis			10:00-11:30 [A3-1] Advanced ironmaking 4 Oral Presentation	10:00-11:50 [B3-1] CO_2 capture, utilization, and storage 6 Oral Presentation	10:00-11:30 [C3-1] Advanced steel refining 2 Oral Presentation
10:30		10:20-11:00 [PL2] Plenary Lecture Prof. Jianliang Zhang								
11:00					10:40-12:10 [A2-1] Advanced ironmaking 3 Oral Presentation	10:40-12:10 [B2-1] CO_2 capture, utilization, and storage 4 Oral Presentation				
11:30		11:20-12:30 [A1-1] Advanced ironmaking 1 Oral Presentation	11:20-12:30 [B1-1] CO_2 capture, utilization, and storage 1 Oral Presentation	11:20-12:30 [C1-1] Thermal energy storage & Ammonia utilization 1 Oral Presentation						
12:00								12:00-12:40 [PL7] Plenary Lecture Prof. Takeo Hoshino		
12:30		12:30-14:00 Lunch/Poster			12:10-13:10 Lunch			Closing		
13:00										
13:30					13:10-14:10 [A2-2] Next iron burden for ironmaking 1 Oral Presentation	13:10-14:10 [B2-2] CO_2 capture, utilization, and storage 5 Oral Presentation	13:10-14:10 [C2-2] Advanced steel refining 1 Oral Presentation			
14:00										
14:30		14:00-15:40 [A1-2] Hydrogen utilization in iron and steelmaking processes (GREINS Project) Oral Presentation	14:20-15:40 [B1-2] CO_2 capture, utilization, and storage 2 Oral Presentation	14:40-15:40 [C1-2] Thermal energy storage & Ammonia utilization 2 Oral Presentation	14:30-15:10 [PL5] Plenary Lecture Mr. Fredric Spiegel					
15:00					Photo Session					
15:30					15:10-15:20 [PS] Photo Session Please enjoy Refresh Walk after the photo session till the Banquet.					
16:00										
16:30	16:00-17:30 [R] Registration @Entrance Hall	16:00-17:40 [A1-3] Advanced ironmaking 2 Oral Presentation	16:00-18:00 [B1-3] CO_2 capture, utilization, and storage 3 Oral Presentation	16:00-17:40 [C1-3] Next carbon source for ironmaking Oral Presentation						
17:00										
17:30	17:30-19:30 [WR] Welcome Reception @Venue (Garden)									
18:00										
18:30										
19:00										
~19:30					19:00-21:00 [B] Banquet @Hall YAMATO (Nara Hotel)					
~21:00										

Congress Programme

Wed 13 November

Room A (Noh theater 1F)

9:30 ~ 9:40

Opening

9:40 ~ 10:20

Plenary Lecture 1

Chairperson : Taichi Murakami (Tohoku University)

PL1-01 The Challenge of Japanese Steel Industry to achieve Carbon Neutrality

○ Seiji Nomura
Nippon Steel Corporation

10:20 ~ 11:00

Plenary Lecture 2

Chairperson : Takuya Natsui (NIPPON STEEL CORPORATION)

PL2-01 Development of a New Pattern of Low-carbon Green Ironmaking In China

○ Jianliang Zhang
University of Science and Technology Beijing

11:20 ~ 12:30

Session A1-1 **Advanced ironmaking 1**

Chairperson : Shigeru Ueda (Tohoku University)

A1-1-01 **Keynote** Carbon Recycling Ironmaking Process using Deposited Carbon and Iron Ore Composite

○ Taichi Murakami[1], Ryota Higashi[1], Yuji Iwami[2], Daisuke Maruoka[1]
1.Tohoku University, 2.JFE Steel Corp.

A1-1-02 Comprehensive study on low carbon iron making technology of top gas recycling oxygen blast furnace

Zedong - Zhang, ○ Jue Tang, Mansheng Chu
University of Northeastern

A1-1-03 Design of High Temperature CO_2 Recovery Reactor Using Honeycomb-shaped Lithium Silicate for Carbon Recycling Blast Furnaces

○ Boxuan Zeng, Takao Nakagaki
Waseda University

14:00 ~ 15:40

Session A1-2 Hydrogen utilization in iron and steelmaking processes (GREINS Project)

Chairperson : Yasuo Kishimoto (JFE Steel Corporation)

A1-2-01 Investigation in Carbon Recycling Reducing Agent Suitable for Injection into Blast Furnace

○ Seiji Uchida, Koichi Takahashi, Yusuke Kashihara, Yuki Kawashiri, Toshiyuki Hirosawa
JFE Steel Corp.

A1-2-02 Analysis of Carbon and Exergy Flows in Steelworks using Carbon Recycling Blast Furnace

○ Masanori Ono[1], Takao Nakagaki[1], Seiji Uchida[2]
1.Waseda University, 2.JFE Steel Corp.

A1-2-03 Numerical analysis of low carbon blast furnace operation by coke oven and hydrogen gases injection in experimental blast furnace

○ Kazumasa Tsutsui, Hiroshi Sakai, Koki Nishioka, Chikashi Kamijo, Kohei Sunahara, Yoshinori Matsukura, Hirokazu Yokoyama, Kazumoto Kakiuchi, Hisashi Kumaoka, Kaoru Nakano
Nippon Steel Corp.

A1-2-04 Carbon Neutralization of Direct Reduction Process by Applying Carbon Recycling

Koki Terui, Kota Moriya, Taihei Nouchi, ○ Sumito Ozawa, Hideo Kijima
JFE Steel Corp.

A1-2-05 GHG reduction by utilizing rice straw in steelmaking process: estimation of the effect of varying the amount of plowing

○ Kazuaki Kobayashi, Hiroyuki Yoshino, Masahiro Sekiya
Nippon Steel Corporation

16:00 ~ 17:40

Session A1-3 Advanced ironmaking 2

Chairperson : Koichiro Ohno (Kyushu University)

A1-3-01 Mechanism of Low-temperature Reduction Disintegration of Self-fluxing Pellets in a Hydrogen-Enriched Blast Furnace

○ Koki Momma, Daisuke Maruoka, Taichi Murakami
University of Tohoku

A1-3-02 Reaction Mechanism and Kinetic Analysis of Carbon Generation in Direct Reduced Iron by Boudouard Reaction

○ Norihide Maeda[1], Shota Yatabe[1], Taichi Murakami[2]
1.Kobe Steel, Ltd., 2.Tohoku University

A1-3-03 Possibility of Biomass as Alternative Carbon Source for FINEX Coal briquettes.

○ Wooil Park[1], Sang-Han Son[1], Ji-ho Yoo[2]
1.POSCO(Pohang Iron and Steel Co., Ltd.), 2.KIER(Korea Institute of Energy Research)

A1-3-04 CO_2 Emission Reduction Technology Development Status in Blast Furnace Process in Korea

○ Woon-Jae Lee[1], Ji-Ook Park[1], Gi-Ho La[1], Young-Seok Lee[1], Sang-Ho Lee[2]
1.POSCO Technical Research Lab, POSCO, 2.POSTECH

A1-3-05 Technical and economic evaluation of the integration of biomass pyrolysis and methanation in oxygen blast furnace ironmaking

○ Manuel Bailera, Cristian Barón, Luis Miguel Romeo
University of Zaragoza

Room B (Meeting Room 3/4 2F)

11:20 ~ 12:30

Session B1-1 CO_2 capture, utilization, and storage 1

Chairperson : Hidetaka Yamada (Kanazawa University),

B1-1-01 CO_2 Capture unit with heat pump system

Keynote

○ Takashi Kamijo[1], Nicola Rossetti[2]
1.Mitsubishi Heavy Industries, Ltd., 2.Turboden

B1-1-02 Demonstration of New Highly durable, Low-emission Amine Solvent Conducted at Commercial CO_2 Capture Plant at Saga City Incineration Plant

○ Koshito Fujita, Shinji Murai, Yasuhiro Kato, Daigo Muraoka, Masaru Horikawa, Kiyohiko Iwasa
Toshiba Energy Systems & Solutions Corp.

B1-1-03 Uncertainty analysis in measuring properties of amine-based aqueous solution for CO_2 capture

○ Yu Miyashita[1], Hirotaka Isogai[1], Yuki Kohno[2], Takashi Makino[2], Takao Nakagaki[1]
1.Waseda University, 2.National Inst. of Advanced Indus. Sci. and Tech.

14:20 ~ 15:40

Session B1-2 CO_2 capture, utilization, and storage 2

Chairperson : Yukitaka Kato (Institute of Science Tokyo)

B1-2-01 Development of CCS Projects in Japan

Yoshihiro Sawada, Jiro Tanaka, ○ Daiji Tanase
Japan CCS Co., Ltd.

B1-2-02 Enhancement of Gas Absorption Rate Using Spinning Horizontal Column Half Immersed into Liquid Absorbent

○ Naoya Izuchi, Xiangyu Gao, Kenji Ishihara, Akihisa Ito, Hiroshi Nogami
Tohoku University

B1-2-03 Carbon dioxide fixation method by seawater concentration using semipermeable membrane

○ Kazuhiro Hirata
Sumitomo Heavy Industries, Ltd.

B1-2-04 Low-temperature regenerable water-lean solvent for energy efficient CO_2 capture

○ Firoz Alam Chowdhury[1], Yoichi Matsuzaki[2]
1.Research Institute of Innovative Technology for the Earth (RITE), 2.Nippon Steel Corporation

16:00 ～ 18:00

Session B1-3 CO_2 capture, utilization, and storage 3

Chairperson : Shinji Kudo (Kyushu University)

B1-3-01 Development of industrial-scale CO_2 electrolyzer toward sustainable manufacturing

○ Yusuke Kofuji[1], Naoya Fujiwara[1], Maki Yonetsu[1], Yasuhiro Kiyota[1], Yuki Kudo[1], Satoshi Mikoshiba[1], Kosuke Yanagi[2], Isamu Kikuchi[2], Shunsuke Kimura[2], Ryota Kitagawa[1]
1.Toshiba Corporation, 2.Toshiba Energy Systems & Solutions Corporation

B1-3-02 Development of zeolite membrane reactor for low-temperature reverse water gas shift

○ Motomu Sakai, Kyoka Tanaka, Masahiko Matsukata
Waseda University

B1-3-03 Performance Evaluation of the Reverse Water-Gas Shift Reaction via Chemical Looping with Alloy-Based Phase Change Material as Thermal Regulator

○ Koji Takizawa[1], DasanayakeAluthge RasikaSanjeewa[1], Noritoshi Yagihashi[1], Kengo Mimura[2], Yuto Shimizu[2], Melbert Jeem[2], Takahiro Nomura[2]
1.Sekisui Chemical Co., Ltd., 2.Hokkaido University

B1-3-04 Development of poly-generation system using various fuels with CO_2 capture

○ Hiroyuki Hamada, Kazuhiro Kidoguchi, Satoshi Umemoto, Hiroyuki Akiho, Yoshinobu Nakao
Central Res. Inst. of Electric Power Industry (CRIEPI)

B1-3-05 Study on the Competitive Reactions between CO_2-O_2 and Fe-C Melts by Isotope Tracing Method

○ Yuewen Fan[1], Hiroyuki Matsuura[2], Xiaojun Hu[1]
1.University of Sci. and Tech. Beijing, 2.The University of Tokyo

B1-3-06 Alkaline hydrothermal reduction of CO_2 with levoglucosan for formic acid production

Riku Mizoguchi, ○ Shinji Kudo, Shusaku Asano, Jun-ichiro Hayashi
Kyushu University

Room C (Meeting Room 1 1F)

11:20 ~ 12:30

Session C1-1 Thermal energy storage & Ammonia utilization 1

Chairperson : Shigehiko Funayama (Institute of Science Tokyo)

C1-1-01 Keynote Cold Thermal Battery System for Effective Utilization of Unused Thermal Energy

○ Koichi Nakaso[1], Koharu Kajimoto[1], Yasushi Mino[1], Kuniaki Gotoh[1], Hiroshi Nogami[2]
1.Okayama University, 2.Tohoku University

C1-1-02 Ammonia Dehydrogenation over Ru Catalysts: Effect of CeO_2 Support Preparation Methods

○ Takahiro Arai, Hiraku Sato, Kenji Nakao
NIPPON STEEL Corp.

C1-1-03 Development of Metal Alloys Based Microencapsulated Phase Change Materials for Thermal Energy Storage Applications

○ Melbert Jeem, Kaixin Dong, Joshua Chidiebere Mba, Takahiro Kawaguchi, Yuto Shimizu, Tomokazu Nakamura, Takahiro Nomura
Hokkaido University

14:40 ~ 15:40

Session C1-2 Thermal energy storage & Ammonia utilization 2

Chairperson : Koichi Nakaso (Okayama University)

C1-2-01 Absorption and Desorption Behaviors of Ammonia on Fluorocomplex Salts by the Pressure-Swing Method

○ Manabu Tokushige, Ryota Fujisawa, Junichi Ryu
Chiba University

C1-2-02 Development of composites for thermochemical energy storage based on calcium hydroxide and silicon-impregnated silicon carbide foams

○ Shigehiko Funayama, Tsukasa Sugiyama, Kyosuke Mochizuki, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

C1-2-03 Development of high working temperature Al-Si alloy phase change material via mechanical microencapsulation method

○ Kaixin Dong[1], Qingda Li[2], Takahiro Kawaguchi[2], Yuto Shimizu[2], Minako Kondo[1], Tomokazu Nakamura[1], Mba Joshua Chidiebere[1], Melbert Jeem[1], Takahiro Nomura[1]
1.Hokkaido University, Faculty of Engineering, 2.Hokkaido University, Graduate School of Engineering

16:00 ~ 17:40

Session C1-3 Next carbon source for ironmaking

Chairperson : Shungo Natsui (Tohoku University)

C1-3-01 Analyzing the pulverized charcoal injection as an alternative for cleaner blast furnace operation applying a multiphase mathematical model

Giulio Antunes Medeiros[1, 2], Beatriz Candido Alonso[1, 2], ○ Jose Adilson Castro[2]
1.Companhia Siderúrgica Nacional, 2.Federal Fluminense University

C1-3-02 Analysis of a cleaner blast furnace practice based on combined hydrogen fuel gas and pulverized charcoal injection

○ Giulio Antunes Medeiros[1, 2], Beatriz Candido Alonso[1, 2], Jose Adilson Castro[2]
1.Companhia Siderúrgica Nacional (CSN), 2.Federal Fluminense University

C1-3-03 Production of metallurgical coke from biomass and lignite: A review

○ Xiangpeng Gao
Murdoch University

C1-3-04 Kinetics modelling and micro-CT analysis of coke reactivity and degradation during H_2O and CO_2 gasification

○ Arash Tahmasebi, Ai Wang, Behnaz Rahmatmand, Salman Khoshk Rish, David Jenkins
University of Newcastle

C1-3-05 Effect of temperature on degradation behaviors during CO_2 and H_2O gasification reactions of coke

○ Zhenjie Zheng[1], Yasuaki Ueki[2], Ichiro Naruse[2]
1.University of Nagoya, 2.Inst. of Materials and Systems for Sustainability

Reception Hall (2F)

12:30 ~ 14:00

Session P Poster Session

P-01 Preparation and characterization of steelmaking slag-based hollow spherical calcium carbonate particles by spray-drying method

○ Shunsuke Onodera, Takeshi Toyama
Nihon University

P-02 Hydrogen production via reaction of molten zinc and water vapor

○ Kaito Otake, Chisako Kasahara, Keiji Okumura
Nagoya Inst. of Tech.

P-03 Absorption and Desorption Behaviors of Ammonia on Calcium Chloride based Ammonia Absorbent

○ Ryota Fujisawa, Manabu Tokushige, Junichi Ryu
Chiba University

P-04 Effect of amino acid addition on supercooling of erythritol

○ Masaya Sugawara, Daiju Wada, Manabu Tokushige, Junichi Ryu
Chiba University

P-05 Thermochemical energy storage performance of an indirect fixed-bed reactor using calcium oxide-based composite

○ Hana Saeki, Tsukasa Sugiyama, Tsuyoshi Izaki, Kenta Tomita, Soichiro Tamano, Shigehiko Funayama, Takashi Kato, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

P-06 Development of PdCu composite H_2-permeable membranes by a reverse build-up method

○ Yoshinari Hozumi, Ryu Hamamura, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

P-07 Reaction Mechanism of Ammonia Formation from Iron Nitride and Carbonated Water

Keiichi Fukami, ○ Hiromi Eba
Tokyo City University

P-08 Key technology of intelligent blast furnace ironmaking based on big data technology

Zhen Zhang[1], ○ Jue Tang[1, 2], Quan Shi[1], Mansheng Chu[1, 3]
1.Northeastern University, 2.Liaoning Low-Carbon Steelmaking Technology Engineering Research Center, 3.Engineering Research Center of Frontier Technologies for Low-Carbon Steelmaking (Ministry of Education)

P-09 Numerical analysis of composite materials using calcium hydroxide and ceramic honeycomb supports of silicon-impregnated silicon carbide

○ Kazuya Fujii, Shigehiko Funayama, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

P-10 Synthesis of siderite particles from iron powder and carbon dioxide

○ Takeru Amano[1], Hiromi Eba[2], Takeshi Toyama[1]
1.Nihon University, 2.Tokyo City University

P-11 Development of hydrogen based shaft furnaces in China

Zichuan Zhao, Jue Tang, Jinge Feng, ○ Mansheng Chu
Northeastern University

P-12 Effect of solidification end heavy reduction on the microstructure property of continuous casting slab and its heredity of rolled thick steel plate

○ Cheng Ji
Northeastern University

P-13 Thermodynamic Analysis of Novel Direct Iron Ore Reduction Systems using Biomass Chemical Looping

○ Xiangxiang Chen, Po-Chih Kuo, Zhuang Sun, Muhammad Aziz
The University of Tokyo

P-14 Performance evaluation of an indirect heated fixed-bed reactor using molten salt for thermochemical energy storage with calcium hydroxide

○ Tsuyoshi Izaki, Tsukasa Sugiyama, Hana Saeki, Kenta Tomita, Kyosuke Mochizuki, Takashi Kato, Shigehiko Funayama, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

P-15 Effects of different cell layers on performance in solid oxide electrolysis cells for carbon dioxide reduction process in carbon recycling ironmaking system

○ Daisuke Moritomo, Daiki Teshima, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

P-16 Conditions for $CaCO_3$ precipitation from calcium-containing glycerol solution extracted from steelmaking slag using CO_2 reaction

○ Ayaka Suzuki[1], Tatsuya Sasaki[2], Kazuki Murakami[2], Koji Sakai[2], Katsuyuki Iijima[2], Takeshi Toyama[1]
1.Nihon University , 2.Kobe Steel, Ltd

P-17 Numerical investigation of an indirect heat fixed-bed reactor with multi reaction tubes for calcium oxide/water-based thermochemical energy storage

○ Kenta Tomita, Tsuyoshi Iizaki, Hana Saeki, Tsukasa Sugiyama, Takashi Kato, Shigehiko Funayama, Hiroki Takasu, Yukitaka Kato
Institute of Science Tokyo

Thu 14 November

Room A (Noh theater 1F)

9:00 ~ 9:40

Plenary Lecture 3

Chairperson : Takahiro Nomura (Hokkaido University)

PL3-01 A novel closed-carbon-loop technology based on inprocess carbon dioxide splitting for decarbonsing energy-and-carbon-intensive industry

○ Yulong Ding

Birmingham University

9:40 ~ 10:20

Plenary Lecture 4

Chairperson : Hideki Murakami (NIPPON STEEL CORPORATION)

PL4-01 Climate Change and the Global Steel Industry

○ Andrew Purvis

World Steel Association

10:40 ~ 12:10

Session A2-1 **Advanced ironmaking 3**

Chairperson : Jose Adilson De Castro (Federal Fuluminense University)

A2-1-01 **Keynote** Model for gas and burden distribution estimation based on in-burden probe data in the blast furnace

○ Henrik Saxén, Ghulam Usama

Åbo Akademi University

A2-1-02 A single pellet kinetic model for the reduction of iron ore with hydrogen

○ Antoine Marsigny, Olivier Mirgaux, Emie Berthelet, Fabrice Patisson

Institut Jean Lamour

A2-1-03 Emissions abatement potential of the DRI-ESF process route

○ Khadijeh Paymooni[1], Craig Garlick[1], Andrew Gadd[2], Tom Honeyands[1]

1.University of Newcastle, 2.BHP

A2-1-04 Challenges brought by H_2 direct reduction shaft furnace and possible countermeasures based on numerical analysis

○ Yandong Zhai[1], Lei Shao[2], Chenxi Zhao[2], Henrik Saxén[1], Zongshu Zou[2]

1.Åbo Akademi University, 2.Northeastern University

13:10 ~ 14:10

Session A2-2 Next iron burden for ironmaking 1

Chairperson : Tatsuya Kon (Kyushu University)

A2-2-01 Influence of the Presence of Metallic Iron and Molten Slag in Pre-reduced Lump Ore on the Softening Deformation of Ore Particles

○ Ren Nakada, Tatsuya Kon, Ko-ichiro Ohno

Kyushu University

A2-2-02 Effect of direct reduced iron produced by MIDREX on smelting behavior of blast furnace

Wenzhuo Ma, Jian Pan, Qingyue Chen, ○ Deqing Zhu, Zhengqi Guo, Congcong Yang

Central South University

A2-2-03 Effect of cooling rate on the microstructure and reducibility of iron ore sinter analogues under CO and H_2

○ Muhammad Irfan Ahadian Barustan[1], Evan Copland[1], Thi Bang Tuyen Nguyen[1], Damien O'Dea[2], Tom Honeyands[1]

1.The University of Newcastle, 2.BHP

14:30 ~ 15:10

Plenary Lecture 5

Chairperson : Takao Nakagaki (Waseda University)

PL5-01 The Northern Lights project

○ Fredric Spiegel

Equinorin the Tokyo office

Room B (Meeting Room 3/4 2F)

10:40 ~ 12:10

Session B2-1 CO_2 capture, utilization, and storage 4

Chairperson : Takao Nakagaki (Waseda University)

B2-1-01 Zeolite Membrane Reactor for Direct FT Synthesis Using CO_2 over Fe-Catalyst

Keynote

○ Masahiko Matsukat, Naoto Chihara, Motomu Sakai

Waseda University

B2-1-02 Industrial application of e-methane produced by IHI methanation technology

○ Hiroyuki Kamata, Kentaro Nariai, Atsushi Nonomura

IHI Corp.

B2-1-03 Membrane Reactors for methanol Synthesis Using LTA-type Zeolite Membranes

○ Yuta Nishikawa[1], Nobuyuki Shigaki[1], Seiji Hosohara[1], Hideo Kijima[1], Masahiro Seshimo[2], Katsunori Yogo[2]

1.JFE Steel Corp., 2.RITE

B2-1-04 Development of integrated process for CO_2 capture and conversion to syngas using transition-metal-free dual-function material

○ Tomone Sasayama, Yuya Ono, Fumihiko Kosaka, Yanyong Liu, Shih-Yuan Chen, Takehisa Mochizuki, Koichi Matsuoka, Koji Kuramoto

AIST

13:10 ~ 14:10

Session B2-2 CO_2 capture, utilization, and storage 5

Chairperson : Manuel Bailera (University of Zaragoza)

B2-2-01 Performance analysis of pressure swing adsorption using flexible metal – organic framework by multi-objective optimization

○ Keisuke Ikeda[1], Yuya Takakura[1], Junpei Fujiki[1], Frantisek Miksik[1], Hiroshi Kajiro[2], Tomoyuki Yajima[1], Yoshiaki Kawajiri[1]

1.Nagoya University, 2.Nippon Steel Corp.

B2-2-02 Development of vacuum pressure swing adsorption process designed for CO_2 capture and utilization

○ Tomoyuki Okida, Nobuyuki Shigaki, Seiji Hosohara, Hideo Kijima

JFE Steel Corp.

B2-2-03 Post-combustion CO_2 Capture Membrane Process for Carbon Neutrality

○ Yeonsoo Chang, Yanghwan Jeong, Kwangseo Cha, Sanghyung Lee

Hyundai Steel

Room C (Meeting Room 1 1F)

13:10 ~ 14:10

Session C2-2 Advanced steel refining 1

Chairperson : Hideki Ono (The University of Tokyo)

C2-2-01 Microstructure of metallic iron phase in iron ore produced by hydrogen reduction

○ Shigeru Ueda, Takayuki Iwama, Takumi Hishika, Ryo Inoue

Tohoku University

C2-2-02 Formation of mesh-like fine iron in foaming slag containing iron oxide

○ Yuki Tamashiro, Tatsuya Kon, Ko-ichiro Ohno

Kyushu University

C2-2-03 Thermodynamic Analysis on Slag/Metal Reactions in Steelmaking Process Using Steel Scraps and Hydrogen-based Direct Reduced Iron with high-P Content

○ Kengo Kato, Hideki Ono
University of Toyama

Fri 15 November

Room A (Noh theater 1F)

9:00 ~ 9:40

Plenary Lecture 6

Chairperson : Yusuke Kashihara (JFE Steel Corporation)

PL6-01 Update on the development of POSCO's hydrogen-based ironmaking process, HyREX

○ Myoung-gyun Shin
POSCO Research Laboratories

10:00~ 11:30

Session A3-1 **Advanced ironmaking 4**

Chairperson : Henrik Saxén (Åbo Akademi University)

A3-1-01 **Keynote** A Comparative Study on Environmentally Friendly Ironmaking Process through Air to Oxygen

○ Sangho Yi[1], Sangwook Kim[2]
1.POSTECH University, 2.POSCO Holdings Inc.

A3-1-02 Thermodynamic analysis and experimental study of coke oven gas self-reforming in gas-based shaft furnace

Chenmei Tang, ○ Jian Pan, Deqing Zhu, Zhengqi Guo, Congcong Yang, Siwei Li
Central South University

A3-1-03 The impact of biocarbon on low-carbon ironmaking processes

○ Gaeon Kim, Han Sang Oh, Ju Won Lee, Yu Bin Lee, Junhee Cho, Jae Hong Kwon, Yoonho Bae, Joonbeom Park, Jong Hyup Lee
Hyundai Steel Co., Ltd.

A3-1-04 Effects of cooling rate on precipitation of copper sulfide in low carbon steels

○ Yoshinao Kobayashi
Institute of Science Tokyo

12:00~ 12:40

Plenary Lecture 7

Chairperson : Yukitaka Kato (Institute of Science Tokyo)

PL7-01 Strategies and Challenges for the Global Steel Industry to Achieve Carbon Neutrality

○ Takeo Hoshino
The University of Tokyo

Room B (Meeting Room 3/4 2F)

10:00 ~ 11:50

Session B3-1 CO_2 capture, utilization, and storage 6

Chairperson : Takahiro Nomura (Hokkaido University)

B3-1-01 Recycling calcium carbonate from steelmaking slag using carbon dioxide
Keynote

○ Takeshi Toyama
Nihon University

B3-1-02 Synthesis of $CaCO_3$ from steelmaking slag in glycerol solution via two-step precipitation

○ Tatsuya Sasaki[1], Kazuki Murakami[1], Koji Sakai[1], Katsuyuki Iijima[1], Takeshi Toyama[2]
1.Kobe Steel, Ltd, 2.Nihon University.

B3-1-03 Effects of Solid-State Microstructure for CO_2 Fixation Reaction Using Iron and Steel

Norika Nakazawa, ○ Hiromi Eba
Tokyo City University

B3-1-04 Development of one-step synthesis process for polycarbonate diol from CO_2

Hiraku Sato[1], ○ Kenji Nakao[1], Masazumi Tamura[2]
1.Nippon Steel Corp., 2.Osaka Metropolitan University

B3-1-05 Kawasaki CO_2 Capture (KCC) from Post-Combustion Gas and Air with Solid Sorbent

○ Shohei Nishibe, Norihiko Kumada, Takeshi Okumura, Ryohei Numaguchi, Takahiro Yamaguchi
Kawasaki Heavy Industries, Ltd.

Room C (Meeting Room 1 1F)

10:00 ~ 11:30

Session C3-1 Advanced steel refining 2

Chairperson : Shigeru Ueda (Tohoku University)

C3-1-01 State diagram of carbon deposition for H-C-O system
Keynote

○ Fengman-Shen, Yan Zhang, Zhimin Ding, Shuo Wang, Haiyan Zheng
Northeastern University

C3-1-02 Enhancement of Cu migration from molten iron by molten oxide electrolysis

○ Shungo Natsui, Kota Mori, Satoshi Honna, Hiroshi Nogami
Tohoku University

C3-1-03 Effect of metallic interlayer on wettability of molten iron and carbon materials immediately after contact

○ Hitoshi Muneoka, Wataru Sato, Tsuyohito Ito, Kazuo Terashima
The University of Tokyo

C3-1-04 Molten iron oxide electrolysis using thermal plasma as electrode

○ Yusuke Noda, Hitoshi Muneoka, Tuyohito Ito, Kazuo Terashima
The University of Tokyo

Room A (Noh theater 1F)

12:40 ~ 12:50

Closing

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