

CURRICULUM VITAE

IN-HO JUNG, Ph.D.

Professor

Department of Materials Science and Engineering, Seoul National University

1 Gwanak-ro, Gwanak-gu, Seoul, South Korea, 08826

Telephone: +82-2-880-7077; email: in-ho.jung@snu.ac.kr

Co-developer of FactSage thermodynamic computing system, www.factsage.com



EDUCATION

Ph.D. in Génie Métallurgique (2003), École Polytechnique, Montreal, Canada.

Dissertation Title: Critical Evaluation and Thermodynamic Modeling of Phase Equilibria in Multicomponent Oxide Systems.

Supervisor: Arthur D. Pelton (Principal supervisor) and Sergei Decterov (Co-supervisor).

M.Sc. in Materials Science and Engineering (1999), POSTECH, Pohang, South Korea. Thesis Title: Thermodynamic Study of the CaO-MgO-SiO₂-Al₂O₃-Fe_tO-MnO-P₂O₅ Ladle Slags

B.Sc. in Materials Science and Engineering (1997), POSTECH, Pohang, South Korea.

MAJOR RESEARCH AREA

1) Development of CALPHAD thermodynamic databases for inorganic materials

The CALculation of PHase Diagram (CALPHAD)-type thermodynamic database is recently widely used in materials design and process optimization. Since his PhD study in 1999, Prof. Jung has devoted himself to develop the thermodynamic database for oxide and metallic systems. His work covers (i) the general oxides system containing Li₂O-Na₂O-K₂O-CaO-MgO-Al₂O₃-SiO₂-FeO_x-MnO_x-TiO_x-CrO_x-ZrO₂-SnO_x-VO_x-P₂O₅-F-S-SO₄, and (ii) general alloy systems for steel, light alloys (Al and Mg), and super alloys (Ni and Co).

In order to develop the accurate thermodynamic database, Prof. Jung's group has performed the diagram experiments for oxide systems using novel experimental techniques. His databases have been widely accessed by academic and industrial researchers and engineers for new materials design and industrial problem solving. Prof. Jung has published more than 170 journal papers in this research area.

2) Applications of thermodynamics and kinetic simulations to process simulation and alloy design

General high temperature pyrometallurgical process, such as steelmaking, involves very complex chemical reactions between slag, gas, liquid metal, refractories, and others. Prof. Jung's group has developed Effective Equilibrium Reaction Zone (EERZ) Model to couple thermodynamics and kinetics to simulate the transition of the chemical composition and temperature at real steelmaking process. This model has been successfully applied to many steelmaking unit processes. The simulators have been well received at steelmaking companies and used for the twin factory in smart factory projects. EERZ model is widely accepted in steelmaking society, and used actively by many research groups around the world. Prof. Jung's group has also developed the solidification, homogenization and precipitation kinetic model for metallic system, and developed the simulation code for light alloys. Prof. Jung has published more than 40 journal papers in this area.

PROFESSIONAL AND ACADEMIC EXPERIENCE

Academic and Industrial Positions

- 03/2020 – Present **Professor**, Department of Materials Science and Engineering, Seoul National University, Seoul, South Korea
- 09/2017 – 02/2020 **Associate Professor**, Department of Materials Science and Engineering, Seoul National University, Seoul, South Korea
- 09/2017 – Present **Adjunct Professor**, Department of Mining and Materials Engineering, McGill University, Montreal, QC, Canada
- 06/2013 – 08/2017 **Associate Professor (tenured)**, Dept. of Mining and Materials Engineering, McGill University, Montreal, QC, Canada
- 05/2016 – 08/2017 **University Tenure Committee**, McGill Univ., Montreal, QC, Canada
- 09/2013 – 08/2014 **Associate Chair**, and **Departmental Graduate Program Director** Dept. of Mining and Materials Engineering, McGill University
- 09/2007 – 05/2013 **Assistant Professor**, Department of Mining and Materials Engineering, McGill University, Montreal, QC, Canada
- 03/2008 – 02/2012 **Adjunct Professor**, Génie Chimique, École Polytechnique, Montreal, Canada
- 03/2008 – 08/2017 **Member**, Centre for Research in Computational Thermochemistry (CRCT), École Polytechnique, Canada

- 12/2003 – 08/2007 **Senior Researcher**, Research Institute of Industrial Science and Technology (RIST), Pohang, South Korea
 09/2003 – 12/2003 **Post-Doctoral Fellow**, Department of Materials Science and Engineering, POSTECH, Pohang, South Korea.

Distinctions

- 06/2012 – 08/2017 **William Dawson Scholar**, McGill Univ. (Equiv. to Canadian Research Chair-Tier II)
 09/2009 – 12/2014 **Gerald Hatch Faculty Fellow**, McGill University
 09/2016 – Present **Guest Professor**, Wuhan University of Science and Technology, Wuhan, China

Professional roles in society: Editorials and leadership

- 09/2020 – Present **ASM International**, Alloy Phase Diagram committee
 01/2020 – Present **Editorial Director & Editor**, Metals and Materials International
 01/2020 – Present **Board of director (project executive)**, **The Korean Ceramic Society**
 01/2018 – Present **APDIC (Alloy Phase Diagram International Commission)** Korea representative
 05/2015 – Present **Key reader (Editorial board)**, Metallurgical and Materials Transactions
 06/2014 – Present **Associate Editor (Editorial board member)**, CALPHAD
 01/2013 – Present **Academic member of FIRE** (Federation of International Refractory Research and Education)
 01/2019 – Present **Scientific Committee Member** (composed of 4 international members), SFI (Centre for Research-driven Innovation) Metal Production, NTNU-SINTEF, Norway
 01/2018 – 12/2019 **Editorial board member**, Korean Journal of Metals and Materials
 01/2019 – 12/2019 **Editorial board member**, Trends in Metals & Materials Engineering, KIMM
 01/2013 – 12/2014 **Editorial board member**, Metals and Materials International
 09/2015 – 08/2018 **Board member**, Korea Institute of Metals and Materials
 09/2013 – 12/2015 **Board member**, Canadian Rare Earth Element Network ('GREEN')
 03/2010 – 12/2013 **Theme Leader**, MagNET Strategic Network (PI. Warren Pools, UBC)
 09/2012 – 12/2015 **Chapter President**, Ass. of Korean-Canadian Scientist and Engineers, Montreal, Canada

AWARDS

- 02/2019 **Editor Choice Award for 2018** from the Journal of Phase Equilibria and Diffusion, Z. You, M. Paek, I-H. Jung, Critical Evaluation and Optimization of the Fe-N, Mn-N and Fe-Mn-N Systems, J. Phase Equilib. Diff., 2018, 39(5), p 650-677.
 01/2018 **Editor Choice Award for 2017** from the Journal of Phase Equilibria and Diffusion, B. Konar, J.Kim, I-H. Jung, Critical Systematic Evaluation and Thermodynamic Optimization of the Fe-RE System: RE = Gd, Tb, Dy, Ho, Er, Tm, Lu, and Y, J. Phase Equilib. Diff., 2017, 38(4), p 509-542.
 09/2016 **World famous scientist lecture award**, Hubei Province Government, China
 02/2016 **TMS Best poster award**, "Thermodynamic Modeling of Hot Metal Desulfurization Using Na₂O-Based Fluxes" by Elmira Moosavi-Khoonsari and In-Ho Jung. TMS 2016 - Bale symposium, Feb. 2016, Nashville, USA.
 11/2015 **REGAL's CQRDA Poster award**, REGAL Student's Day-JER2015, Chicoutimi, Quebec, Canada. "Experimental investigation and thermodynamic modeling of the Al-Cr-Mg system" by Senlin Cui and In-Ho Jung.
 08/2015 **Best poster award**, NATAS 2015, Montreal, Canada.
 "Thermal analysis and thermodynamic optimization of the K₂O-SiO₂ and K₂O-Al₂O₃ systems", by Dong-Geun Kim, Marie-Aline Van Ende and In-Ho Jung
 08/2015 **Editor Choice Award for 2014** from the Journal of Phase Equilibria and Diffusion, J. Wang, P. Hudon, D. Kevorkov, P. Chartrand, I.-H. Jung, and M. Medraj, "Thermodynamic and Experimental Study of the Mg-Sn-Ag-In Quaternary System", J. Phase Equilib. Diff., 2014, 35, p 284-313
 08/2014 **Engineers of the Year 2014 – Canada**, The Korean Federation of Science and Technology Societies, South Korea.
 06/2014 **Best poster award, CALPHAD 2014 meeting, Changsha, China**
 Sazol Kumar Das and In-Ho Jung: "Diffusion study on Mg-based alloys: an experimental and modeling approach" (one of two best posters among 120 posters)
 02/2014 **TMS LMD Young leader Professional Development Award**, TMS, 2014, USA
 07/2013 **Helmholtz-Zentrum Geesthacht Magnesium Research Award 2013**, Germany
 05/2013 **Christophe Pierre Award for Research Excellence: Early Career**, Faculty of Engineering, McGill University

- 02/2013 **NSERC 2012 Leo Derikx Synergy Award**, Natural Sciences and Engineering Research Council, Canada
- 04/2011 **Professor of the Year**, Material Eng. Undergraduate Society, McGill University.
- 06/2007 **Best poster awards**, CALPHAD 2007 meeting, USA
Y.-B. Kang, I.-H. Jung and H.-G. Lee, "Experiment and thermodynamic optimization of the MnO-SiO₂-TiO₂-Ti₂O₃ system for application to steel production"
- 03/2007 **2006 Best Technology of RIST (Research Institute of Industrial Science and Technology)**, Team award (Mg project team; 7 researchers and 8 engineers), "Production technology of Mg thin plate", Pohang, Korea. (Annually awarded to only one excellent project out of over 300 projects).
- 2006 **Young Scientist Lecturer Award**, Asia Steel Inter. Conf., 2006, Japan.
- 1997 **3rd POSCO Iron and Steelmaking Paper Contest** (Second best paper award), Korea.

ORGANIZATION COMMITTEE for INTERNATIONAL CONFERENCES AND SYMPOSIA

- 2021 Technical committee, Asia Steel Conference 2021, Gyeongju, South Korea, June, 2021
- 2021 International advisory committee, 12th International Conference on Magnesium Alloys and their Applications (Mg 2021), TMS, Montreal, Canada, July 2021.
- 2020 International advisory, Local organizing, Technical program steering Committee, MOLTEN 2020, Seoul Korea (postponed to Feb. 2021)
- 2019 Chief Organizer, Steel Science Forum, Seoul National University, Korea, July 2019.
- 2018 International Committee, Mg 2018, 11th Int. Conf. on Magnesium Alloy and their Applications, UK
- 2017 International Scientific Committee, CALPHAD XLVI, Saint Malo, France, June, 2017.
- 2016 Chief Organizer, Thermodynamic applications, optimizations and simulations in high temperature processes: TMS Symposium in the honor of Prof. Christopher W. Bale, TMS2016, Nashville, USA
- 2016 International Scientific Committee, CALPHAD XLV, Japan, June, 2016.
- 2015 Technical Committee, America's Conference on Al Alloys, Toronto, Canada, August 2015
- 2015 International Committee, Mg 2015, 10th Int. Conf. on Magnesium Alloy and their Applications, Korea
- 2015 International Scientific Committee, CALPHAD XLIV, Loano, Italy, June, 2015.
- 2014 Co-Organizer, Multiscale Model. Sim. Failure in Structural Materials, COM 2014, Vancouver, Canada
- 2014 Co-Chairman, Symposium on Advance in Computational Thermodynamics, dedicated to the 70th birthday of Prof. Arthur Pelton, Montebello, Canada
- 2014 Co-Organizer, PSDK-IX, MS&T 2014, Pittsburg, USA
- 2013 Co-Organizer, 3rd International Workshop on Rare Metals, Montreal, Canada
- 2013 Organizing Committee, MS&T / COM 2013, Montreal, Canada
- 2012 National Committee, 9th Int. Conference on Magnesium Alloy and their Applications
- 2012 Organizing Committee, COM 2012, Rare Earth Element Symposium
- 2010 Organizer, Young Calphadian Meetings during Annual Calphad Meetings (2002~2010; 4 times)

SUPERVISION OF GRAUDATE STUDENTS and POST-DOCS (August, 2020)

Current supervision at **Seoul National University**:

1 Research Professor, 14 Graduate students, 5 visiting and undergraduate intern students.

Current supervision at **McGill University**:

2 PhD students.

Student Graduations at McGill University since 2007:

12 Masters students, 10 PhD students, 8 Post Doctoral Fellows.

SCIENTIFIC PUBLICATIONS (August 2020)

216 Journal publications, 108 Conference papers, over 150 Conference presentations without full paper, 6 Book chapters, over 37 Invited talks in international conferences and symposiums, **85 Invited talks** in special workshops, industries, universities and research institutes, and **22 Patents**.

H-index = 39, total number of citation = 6305 as of August 14, 2020 (Scopus)

SELECTED PUBLICATIONS

Book Chapters

- 1) Elhachmi Essadiqi, In-Ho Jung, Mary Wells, "Twin Roll Casting - processing and process modelling" in "Advance in Mg wrought alloy development" Woodhead Publishing, 2012, pp. 272-303.
- 2) Jean Lehman, Klaus Hack, Marie-Aline Van Ende, Evgueni Jak, In-Ho Jung, "Computational thermodynamics" in Treatise on Process Metallurgy: Process Phenomena, Volume 2: Process Phenomena, ed. S. Seetharaman, A. McLean, R. Guthrie, and S. Sridhar, Elsevier, 2014, 587-852. (ISBN 9780080969848)
- 3) Marie-Aline Van Ende and In-Ho Jung, "Applications of Thermodynamic Database to the Kinetic Steelmaking Process

Simulations”, in “Computational Materials System Design” ed. Dongwon Shin and James Saal, 2018, Chapter 3, Springer (ISBN 978-3-319-68280-8).

- 4) Manas Paliwal and I.-H. Jung, “Prediction of as cast microstructure of multicomponent light alloys”, in “Computational Materials System Design” ed. Dongwon Shin and James Saal, 2018, Chapter 5, Springer (ISBN 978-3-319-68280-8).
- 5) M. Rigaud, J. Smith, I.-H. Jung, J. Poirier, “Thermodynamics” in FIRE Compendium Series Volume 2A Corrosion of Refractories: The Fundamentals, ed. J. Poirier and M. Rigaud, Goller Verlag, 2017.
- 6) I.-H. Jung et al. “A selection of industrial case studies” in FIRE Compendium Series Volume 2C Corrosion of Refractories: The Impacts of Corrosion, ed. M. Rigaud, Goller Verlag, 2018.

Representative Journal Publications; (Bold = corresponding author)

- 1) **I.-H. Jung**, and M.-A. Van Ende, “Computational Thermodynamic Calculations: FactSage from CALPHAD Thermodynamic Database to Virtual Process Simulation”, Metall. Mater. Trans. B, 2020, online (**Invited paper for MMTB 50th anniversary collections**).
- 2) **C.W. Bale**, E. Béliisle, P. Chartrand, S.A. Deckerov, G. Eriksson, K. Hack, I.-H. Jung, Y.-B. Kang, J. Melançon, A.D. Pelton, C. Robelin and S. Petersen, “FactSage thermochemical software and databases - recent developments”, Calphad, 2009, vol. 33 (2), pp. 295-311. (**# of citation – Scopus, > 1200**)
- 3) I.-H. Jung, S.A. Deckerov and **A.D. Pelton**, “A thermodynamic model for deoxidation equilibria in steel”, Metall. Mater. Trans. B, 2004, vol. 35 (3), pp. 493-507. (**TMS Landmark Paper**)
- 4) **I.-H. Jung**, D.H. Kang, W.J. Park, N. J. Kim and S.H. Ahn, “Thermodynamic modeling of the Mg-Si-Sn system”, Calphad, 2007, vol. 31 (2), pp. 192-200.
- 5) I.-H. Jung, S.A. Deckerov and **A.D. Pelton**, “Computer applications of thermodynamic databases to inclusion engineering”, ISIJ Inter., 2004, vol. 44 (3), pp. 527-536.
- 6) I.-H. Jung, S. A. Deckerov and **A.D. Pelton**, “Thermodynamic evaluation and optimization of the MgO-Al₂O₃, CaO-MgO-Al₂O₃ and MgO-Al₂O₃-SiO₂ systems” J. Phase Equilib. Diff., 2004, vol. 25 (4), pp. 329-345.
- 7) I.-H. Jung, S. A. Deckerov and **A.D. Pelton**, “Critical thermodynamic evaluation and optimization of the CaO-MgO-SiO₂ system” J. Eur. Ceram. Soc., 2005, vol. 25 (4), pp. 313-333.
- 8) I.-H. Jung, Mehdi Sanjari, Junghwan Kim and Stephen Yue, “Role of RE in the deformation and recrystallization of Mg alloy and new alloy design concept for Mg-RE alloys”, Scripta Materialia, , vol. 102, 2015, pp. 1-6.
Viewpoint paper
- 9) S. Das, Y.B. Kang, T.K. Ha and I.-H. Jung, “Thermodynamic Modeling and Diffusion Kinetic Experiments of Binary Mg-Gd and Mg-Y Systems”, Acta Materialia, vol. 71, 2014, pp. 164-175.
- 10) I.-H. Jung, Y.-B. Kang, S.A. Deckerov and **A.D. Pelton**, “Thermodynamic evaluation and optimization of the MnO-Al₂O₃ and MnO-Al₂O₃-SiO₂ systems and applications to inclusion engineering”, Metall. Mater. Trans. B, 2004, vol. 35 (2), pp. 259-268.
- 11) **I.-H. Jung**, “Overview of the applications of thermodynamic database to steelmaking process”, Calphad, 2010, vol. 34 (3), pp. 332-362. (**Invited review paper**)
- 12) M.-A. Van Ende and **I.-H. Jung**, “A Kinetic Ladle Furnace Process Simulation Model: Effective Equilibrium Reaction Zone Model using FactSage Macro processing”, Metallurgical and Materials Transaction B, vol. 48, 2017, pp. 28-36.

Invited Presentations and lectures in International/Domestic Conferences and Special Forum (since 2015)

- 1) J.-H. Lee, S. Kown, P. Hudon and **I.-H. Jung**, “Thermodynamic modeling of As oxide in the Na₂O-CaO-MgO-SiO₂ system and its application to As oxide stabilization process using glass formation”, Symp. Materials Processing Fundamentals, TMS 2020, Feb. 23-27, SanDiego, USA (**Invited presentation**)
- 2) **I.-H. Jung** and Jungwook Cho, “Utilization of Non-metallic Inclusion and Optimization of Alloy Compositions for AM Process”, Symp. Additive Manufacturing: ICME Gap Analysis, TMS 2020, Feb. 23-27, SanDiego, USA (**Invited presentation**)
- 3) **I.-H. Jung**, “Corrosion of Refractories by Alkali Slags: Thermodynamic Analysis”, Korean Refractory Symposium, Oct. 18, 2019, Seoul, South Korea (**Invited lecture**)
- 4) **I.-H. Jung**, “Application of thermodynamic database in Glass making process”, 34th Korean Glass Symposium, Dec. 6, 2019 (**Invited lecture**)
- 5) **I.-H. Jung**, “From CALPHAD to Smart Factory – Steelmaking”, KIMM Fall meeting, Oct. 2019 (**invited lecture**)
- 6) **I.-H. Jung**, “CALPHAD Thermodynamic Database and Applications to Steelmaking process and Alloy design”, Steel Forum Korea – 2019, Seoul, Korea, July 18-19, 2019 (**Invited lecture**)
- 7) **I.-H. Jung**, “Thermodynamics of High and ultra-high temperature ceramics: phase diagrams, chemical reactions, computational thermodynamic database” European Ceramic Society - Summer School, Turin, Italy, June 13-14, 2019

(Invited lecture)

- 8) **In-Ho Jung**, “Applications of Phase diagrams to Refractory Research”, 11th Inter. Conf. on High-Performance Ceramics (CICC-11), Kunming, China, May 2019 (**keynote lecture**)
- 9) Marie-Aline Van Ende and **In-Ho Jung**, “Smart Factory: Thermodynamic databases and Process simulation models for Steelmaking process”, KIMM Spring Meeting, 2019, ChangWon, South Korea (**Invited talk**)
- 10) **In-Ho Jung**, “Development of new metallic database for steel and ferro-alloy applications”, KIMM Fall Meeting, Oct.24-26, 2018, DaeJeon, South Korea (**Invited talk**)
- 11) **In-Ho Jung**, “Applications fo Phse diagrams in Refractory Corrosion study”, Korean Refractory Symposium, Nov. 2, 2018, Seoul, South Korea (**Invited lecture**)
- 12) **In-Ho Jung**, Marie-Aline Van Ende, Dong-Geun Kim, Elmira Moosavi-Koohsara, and Minami Tai, “Thermodynamic modeling of the K₂O containing slag system for the coal combustion system and its refractory”, CIMTEC, Italy, June 12, 2018 (**Invited lecture**).
- 13) **In-Ho Jung**, “Recent advance in thermodynamic database of liquid steel for steelmaking process”, Asia Steel 2018, India, 2018 (**keynote presentation**)
- 14) **In-Ho Jung**, “A kinetic RH degasser process simulation, and refractory corrosion analysis”, Korean Refractory Symposium, Nov. 2, 2017, Seoul, South Korea (**Invited lecture**)
- 15) **In-Ho Jung**, “Development of new high alloy liquid steel database for steelmaking application”, Korea-Japan Iron and Steelmaking workshop, Nov. 3-5, YeSeu, South Korea, 2017 (**Invited talk**)
- 16) **In-Ho Jung**, “Development of thermodynamic database for the CaO-MgO-Al₂O₃-SiO₂-Na₂O-K₂O-Li₂O-F system and its applications to de-S and de-P calculations” KIMM Fall Meeting, DaeGu, South Korea, Oct. 25-27, 2017 (**Invited lecture**)
- 17) **In-Ho Jung**, “Thermodynamic approach for solution chemistry and process condition for SiC single crystal using liquid solution method” Korean Cearmic Society Fall Meeting, Seoul, South Korea, Oct. 12-14, 2017 (**Invited lecture**)
- 18) **In-Ho Jung**, “Application of thermodynamic databases for the virtual steelmaking plants”, 29th Canadian Materials Science Conference (CMSC 2017), Ottawa June 20-23, 2017 (**Invited lecture**)
- 19) **In-Ho Jung**, “Recent advance in thermodynamic databases for steelmaking process” 2017 Metallurgy Innovation Symposium (MIS) Conference, Beijing, June 6-8, 2017 (**Invited lecture**).
- 20) **In-Ho Jung**, M.-A. Van Ende, and P. Hudon, “Recent progress of FactSage Oxide database for pyrometallurgical applications” JCPD semiannual meeting (JSPS 172 committee), Sapporo, Japan, 2015 (**Invited lecture**)
- 21) Marie-Aline Van Ende and **In-Ho Jung**, “A Kinetic Process Simulation Model for Basic Oxygen Furnace (BOF): Importance of slag chemistry for BOF operation”, ISIJ Fall Meeting, International Session, Kyushu, September, 2015, (**Invited lecture**), CAMP-ISIJ, vol.28, pp. 527-530.
- 22) **In-Ho Jung**, M.-A Van Ende, D.-G. Kim, B. Konar and D. Nassyrov, “Development of total solution for mold flux design in steelmaking: a thermodynamic database, kinetic solidification model, viscosity model and continuous casting process simulation tool”, IUMRS-ICAM2015, Oct.. 2015, Jeju, Korea (**Invited lecture**)
- 23) Eric Thibodeau and **In-Ho Jung**, “A Structural Molar Volume Model for Oxide Melts”, AGU2015, May, 2015, Montreal, Canada. (**Invited talk**)
- 24) **In-Ho Jung**, “Recent development of thermodynamic database on RE metals and RE oxides for the application to the recovery of RE from waste materials”, 11th International Conference on Ceramic Materials and Components for Energy and Environmental Applications, Amer. Ceram Soc, Vancouver, June, 2015 (**Invited lecture**).

MAJOR INDUSTRIAL SUPONSORS (Present)

Korea: Posco, Hyundai Steel, Doosan Heavy Industry & Construction, SeAh Besteel/Special Steel

Japan: Nippon Steel Corp., JFE Steel

Europe: Voestalpine, Tata Steel Europe, RHI-Magnesita, Elkem, Almatis, Imerys

North America: Nucor Steel, RioTinto