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**H. Y. SOHN** **Distinguished Professor**, Department of Materials Science & Engineering, University of Utah, 135 S 1460 E RM 412, Salt Lake City, Utah 84112–0114

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**Adjunct Distinguished Professor**, Department of Chemical Engineering, University of Utah

**Honorary Professor of Metallurgy**, Department of Metallurgy, Kunming University of Science and Technology, Kunming, Yunnan, China

**Honorary Professor**, Anhui University of Technology, Maanshan, Anhui, China

**Advisor**, LS-MnM (formerly LS-Nikko Copper Inc.), Ulsan, Korea

**Advisor**, Korea Institute of Geoscience and Mineral Resources (KIGAM)

DEGREES Ph.D. Ch.E. University of California, Berkeley, 1970

M.Sc. Ch.E. University of New Brunswick, 1966

B.S. Ch.E. Seoul National University, 1962

POSITIONS HELD **Distinguished Professor of Metallurgical Engineering**, Department of Metallurgical Engineering (2014 – present), University of Utah

**Member**, Advisory Board, International Academy of Science, Engineering, and Technology (International ASET Inc.), 2015 – present

**Advisor**, Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon, Korea, 2010

**Advisor**, LS-Nikko Copper Inc., Ulsan, Korea, 2005 – present

**Honorary Professor**, Anhui University of Technology, Maanshan, Anhui, China, 1998 – present

**Visiting Professor**, Royal Institute of Technology, Stockholm, Sweden, 1996; offered a graduate course on “Heterogeneous Kinetics”

**Honorary Professor** of Metallurgy, Department of Metallurgy, Kunming University of Science and Technology, Kunming, Yunnan, China, April 1989 – present

**Director, State Center of Excellence for Advanced Pyrometallurgical Technology**, University of Utah, 1988 – 1993

**Visiting Professor** of Chemical Engineering, Department of Chemical Engineering, Chunnam National University, Kwangju, Korea (1987); offered a graduate course on “Fluid–Solid Reaction Engineering”

**Adjunct Professor, Department of Chemical Engineering**, University of Utah (1987 – present)

**Visiting Professor** of Metallurgical Engineering, Kennecott Copper Corporation, Salt Lake City, Utah (1981)

**Visiting Professor** of Chemical Engineering, Department of Chemical Engineering, Korea Advanced Institute of Science, Seoul, Korea (Fall, 1980); offered a graduate course on “Gas–Solid Reactions”

**Professor of Metallurgical Engineering**, Department of Metallurgical Engineering (1980 – 2014), and Adjunct Professor of Fuels Engineering, Department of Fuels Engineering (1980 – 1993), University of Utah

**Visiting Professor** of Chemical Engineering, Korea Institute of Science and Technology, Seoul, Korea (Summer, 1978)

**Associate Professor of Metallurgy and Metallurgical Engineering**, Department of Metallurgy and Metallurgical Engineering (1977 – 1980), and Adjunct Associate Professor of Fuels Engineering, Department of Mining and Fuels Engineering (1978 – 1980), University of Utah

**Associated Western Universities–ERDA Fellow** at Laramie Energy Research Center, Laramie, Wyoming (Summer, 1976)

**Summer Professor**, Earth Science Division, Lawrence Livermore National Laboratory, Livermore, California (1975, 1976, 1977)

**Assistant Professor of Metallurgical Engineering**, Department of Mining, Metallurgical and Fuels Engineering, University of Utah (1974 – 1977)

**Research Engineer**, Engineering Technology Laboratory, E.I. du Pont de Nemours and Co., Wilmington, Delaware (1973 – 1974)

**Postdoctoral Associate** and **Part–Time Lecturer**, State University of New York at Buffalo, Buffalo, New York (1971 – 1973)

**Teaching Associate/Research Assistant**, University of California, Berkeley, California (1966 – 1970)

**Teaching Associate/Research Assistant**, University of New Brunswick, Fredericton, New Brunswick, Canada (1964–1966)

**Engineer**, Canada Starch Co., Cardinal, Ontario, Canada (1966)

**Research Engineer**, Cheil Sugar Co., Pusan, Korea (1961 – 1964)

Professional Organizations

HONORS AND AWARDS

● **The 2023 NASA Big Idea Challenge** **Artemis Award**, awarded to Utah Student Team led by Professor H. Y. Sohn.

● Best Paper Award, 2nd Int. Conf. on Mining, Material and Metallurgical Eng. (MMME’15), 2015, Barcelona, Spain.

● **Distinguished Professor,** 2014, University of Utah.

● **Educator Award**, The Minerals, Metals and Materials Society (TMS) of AIME, 2014.

● **Distinguished Scholarly and Creative Research Award**, 2012, University of Utah.

● **Billiton Gold Medal**, 2012, The Institute of Materials, Minerals and Mining, U.K.

● **TMS 2009 Fellow Award**, in recognition of outstanding contribution to the practice of metallurgical/materials science and technology, The Minerals, Metals and Materials Society (TMS) of AIME.

**●** Honored with “**Sohn International Symposium** on Advanced Processing of Metals and Materials: Principles, Technologies and Industrial Practice,” TMS, San Diego, California, August 27-31, 2006.

**● AIME James Douglas Gold Medal Award,** 2001 (for leadership and outstanding contributions in research and education of nonferrous extractive metallurgy and for work related to the modeling of gas-solid reactors and the development of novel solvent extraction systems),American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME).

**●** **Fellow Award**, **KAST (**Korean Academy of Science and Technology), March 1998(elected member, March 1997; Fellow Emeritus, Nov. 2011).

● **TMS Champion H. Mathewson Gold Medal** **Award**, 1993 (for the most notable contribution to Metallurgical Science in the 3–year period), The Minerals, Metals and Materials Society (TMS) of AIME.

● **TMS Extractive Metallurgy Lecturer** **Award**, 1990 (in recognition as an outstanding scientific leader in the field of nonferrous extraction and processing metallurgy), The Minerals, Metals and Materials Society (TMS) of AIME.

● **TMS 2007 Extraction and Processing Science** **Award,** The Minerals, Metals and Materials Society (TMS) of AIME, for paper entitled “The Influence of Chemical Equilibrium on Fluid-Solid Reaction Rates and the Falsification of Activation Energy,” Metall. Mater. Trans. B, 35B, 121-131 (2004). [**The first 4-time winner of the TMS Science Award.**]

● **TMS 1999 Extraction and Processing Science** **Award,** The Minerals, Metals and Materials Society (TMS) of AIME, for papers coauthored with S. PalDey entitled “Synthesis of Ultrafine Particles of Intermetallic Compounds by the Vapor–Phase Magnesium Reduction of Chloride Mixtures: Part I. Titanium Aluminides” and “Part II. Nickel Aluminides,” Metallurgical and Materials Transactions B, vol. 29B, 457–464; 465–469 (1998).

● **TMS 1994 Extraction and Processing Science** **Award,** The Minerals, Metals and Materials Society (TMS) of AIME, for papers coauthored with B. C. Paul and M. K. McCarter entitled “Model for Ferric Sulfate Leaching of Copper Ores Containing a Variety of Sulfide Minerals: Part I. Modeling Uniform Size Ore Fragments” and “Part II. Process Modeling of In Situ Operations,” Metallurgical Transactions B, vol. 23B, 537–548; 549–555 (1992).

● **TMS 1990 Extractive Metallurgy Science** **Award,** The Minerals, Metals and Materials Society (TMS) of AIME, for a paper coauthored with Y. B. Hahn entitled “The Trajectories and Distribution ofParticles in a Turbulent Axisymmetric Gas Jet Injected into a Flash Furnace Shaft,” Metallurgical Transactions B, vol. 19B, 871–884 (1988).

Private and Government Foundations

● **Camille and Henry** **Dreyfus Foundation Teacher–Scholar Award** (1977)

● **Fulbright Distinguished Lecturer**: Lima, Cuzco, and Arequipa, Peru, November 14–25, 1983

● **Japan Society for the Promotion of Science Fellowship** for Research and Lecture in Japan, 1990

● Appointed **Advisor**, LS-Nikko Co., Korea, 2005

● Appointed **Advisor**, Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon, Korea, 2010

● **Fossil Energy Lecturer,** U.S. Department of Energy, 1978–81

● **Alcoa Foundation** Science Support Grant, 1982

University of Utah

● **Distinguished Professor,** 2014, University of Utah.

● **Distinguished Scholarly and Creative Research Award**, 2012, University of Utah.

● **Outstanding Teacher Award** for 1985–86, College of Mines and Mineral Industries

● **Finalist for Distinguished Teaching Award**, University of Utah, 1985

● Outstanding Faculty Teaching Award, Department of Metallurgical Engineering, 2015–2016

● Outstanding Faculty Teaching Award, Department of Metallurgical Engineering, 2009–2010

● Outstanding Faculty Teaching Award, Department of Metallurgical Engineering, 2005–2006

● Outstanding Faculty Teaching Award, Department of Metallurgical Engineering, 2003–2004

● Outstanding Faculty Teaching Award, Department of Metallurgical Engineering, 2002–2003

● Outstanding Professor Teaching Award, Department of Metallurgy and Metallurgical Engineering, 1985–1986

**Plenary and Keynote Lectures**

● Plenary Lecturer, 1984 International Congress on Applied Mineralogy in the Mineral Industry, February 22–25, 1984, Los Angeles, California

● Keynote Lecturer, Rare Metals '90, November 14–16, 1990, Kitakyushu, Japan

● Plenary Lecturer, The Fourth National Congress of Nonferrous Extractive Metallurgy, Guaymas, Sonora, Mexico, May 27–29, 1992.

● Plenary Lecturer, NATO Advanced Research Workshop on Flash Reaction Processes, May 6–9, 1994, Istanbul, Turkey.

● Plenary Lecturer, the 8th National Congress of Metallurgy and the 3rd Congress of the Latin American Association of Metallurgy and Materials, August 8–12, 1994, Antofagasta, Chile.

● Keynote Lecturer, FOMINOR (Foro Minero del Norte) '95, Antofagasta, Chile, Nov. 29–Dec. 1, 1995.

● Keynote Lecturer, the 3rd International Colloquium on Process Simulation, June 12–14, 1996, Espoo, Finland.

● Plenary Speaker, International Symposium on Sulfide Smelting '98, 127th TMS Annual Meeting, San Antonio, Texas, February 15–19, 1998.

● Keynote Lecturer, The Third International Conference on Hydrometallurgy, Kunming, China, November 3–5, 1998.

● Keynote Lecturer, XI Congreso Argentino de Fisicoquímica and I Congreso de Fisicoquímica del Mercosur, Santa Fe, Argentina, April 19-23, 1999.

● Keynote Lecturer, The 9th International Congress of Extractive Metallurgy, Hermosillo, Sonora, Mexico, May 26-29, 1999.

● Keynote Lecturer, MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia,, September 9-10, 2000.

● Plenary Speaker, PMP 2000: Second International Conference on Processing Materials for Properties, MMIJ (Japan) and TMS (U.S.), San Francisco, California, November 5-8, 2000.

● Plenary Speaker, Third International Symposium on Sulfide Smelting-Sulfide Smelting ’02, 131st TMS Annual Meeting, Seattle, Washington, February 17-21, 2002.

● Keynote Lecturer, Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, San Diego, California, March 2-6, 2003.

● Invited Lecturer, ’06 International Conference on Agglomeration of Iron Ores, Changsha, Hunan, China, November 3-6, 2006.

● Keynote Lecturer, The 4th International Congress on the Science and Technology of Ironmaking (ICSTI ’06), Osaka, Japan, November, 26 to 30, 2006.

● Congressional Briefing, “Novel Ironmaking Technology with Low Energy Requirement and CO2 Emission,” 3rd Annual AISI Environmental Briefing on Capitol Hill, April 21, 2008.

● Plenary Lecturer, International Conference on the Advances in Theory of Ironmaking and Steelmaking (ATIS), Indian Institute of Science, Bangalore, India, December 9 - 11, 2009.

● Invited Speaker, International Symposium on Ironmaking for Sustainable Development 2010 (ISISD 2010), Osaka, Japan, January 28 – 29, 2010.

● Keynote Lecture, 1st International Symposium on High-Temperature Metallurgical Processing (1st ISHTMP), 139th TMS Annual Meeting, Seattle, Washington, February 14-18, 2010.

● Keynote Lecture, The 6th International Congress on the Science and Technology of Ironmaking (ICSTI ’12), Oct. 14 – 18, 2012, Rio de Janeiro, Brazil.

● Keynote Speaker, David Robertson Symposium on Celebrating the Megascale, 143rd TMS Annual Meeting, San Diego, California, 2014.

● Keynote Speaker, Energy Technology 2014 Carbon Dioxide Management and Other Technologies, 143rd Annual TMS Meeting, San Diego, California, 2014.

● Invited Presentation and Panel Member, H2@Scale Workshop, organized by Fuel Cell Technologies Office, Energy Efficiency and Renewable Energy, U.S. DOE, held at National Renewable Energy Lab, Golden, CO, November 16-17, 2016.

Others

● **AMAX Lecturer**, University of Nevada, Reno, 1983.

● Honored by “International Symposium on Metals and Materials Processing (ISOMMP 2001)” held **in Honor of H. Y. Sohn** on the Occasion of his 60th Birthday, organized by P.C. Chaubal, Y.-B. Hahn, and K.-I. Rhee, Salt Lake City, Utah, August 15-17, 2001.

Listed in:

— Who's Who in the World

— Five Thousand Personalities of the World

* The Most Admired Men and Women
* Who's Who in America

— Men of Achievement

— Outstanding People of the 20th Century

* Two Thousand Outstanding Intellectuals of the 21st Century (also of the 20th Century)
* Great Lives of the 21st Century
* Distinguished & Admirable Achievers

— Two Thousand Notable Americans; Directory of Distinguished Americans

— American Men and Women of Science

— Who's Who in Science and Engineering; Who's Who in Technology; Who's Who in Engineering; Who's Who in Technology Today

— Who's Who in Frontiers of Science and Technology

* Two Thousand Scientists of the 20th Century; Two Thousand Outstanding Scholars of the 20th Century

— Personalities of America; Who's Who in American Education

— The International Directory of Distinguished Leadership; Who's Who in Emerging Leaders in America

— International Book of Honor; Dictionary of International Biography (International Man of the Year 1999-2000)

* Who's Who in the West; Who's Who in Community; Who’s Who in Finance and Business
* Who's Who among Asian Americans; Asian/American Who’s Who; Asia/Pacific Who’s Who; Asian Admirable Achievers

PUBLICATIONS See attached list. (5 monographs, 20 edited books, 36 book chapters, some 600 papers, 4 patents, 37 technical reports, some 240 invited lectures, some 250 abstracts and presentations.)

See <http://libra.msra.cn/Detail?entitytype=4&searchtype=1&id=6930> for Metall. Mater. Trans. B publication list.

MEDIA OUTREACH

 Steel's contribution to a low carbon future and climate resilient societies. 08/2015. [worldsteel.org/publications/position-papers/Steel-s-contribution-to-a-low-carbon-future.html](http://www.worldsteel.org/publications/position-papers/Steel-s-contribution-to-a-low-carbon-future.html)

 US Congressional Briefing: AISI 2008 Environmental Briefing Summary - YouTube <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwj79dbslIX3AhW0DkQIHeIMB4wQFnoECBUQAQ&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DszZ1JTajBKc&usg=AOvVaw1xGok6bj7nPjGPvk3jVNZY>

 US Congressional Briefing: AISI 2008 Environmental Briefing - YouTube <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwj79dbslIX3AhW0DkQIHeIMB4wQFnoECAIQAQ&url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3D9G1cnR_9Fl8&usg=AOvVaw2qs4uRjsKCVPYrH1VJo0OJe>

 Metal Bulletin Magazine June 2015

[MetalBulletin-Magazine-Article-with-Cover.pdf](http://webs.purduecal.edu/civs/files/MetalBulletin-Magazine-Article-with-Cover.pdf)

 U.S. Department of Energy 5/28/2015 [energy.gov/sites/prod/files/2015/06/f22/R8-AMO%20Peer%20Review%20May%2028-29%202015%20\_EE0005751%20Flash%20Ironmaking.pdf](http://energy.gov/sites/prod/files/2015/06/f22/R8-AMO%20Peer%20Review%20May%2028-29%202015%20_EE0005751%20Flash%20Ironmaking.pdf)

 U.S. Department of Energy 03/2015. [energy.gov/sites/prod/files/2015/03/f20/flash\_ironmaking\_process\_factsheet.pdf](http://energy.gov/sites/prod/files/2015/03/f20/flash_ironmaking_process_factsheet.pdf)

 Mobarakeh Steel Newsletter 2/2015 <https://en.msc.ir/my_doc/msc/magazines/newsletter/2.pdf>

 American Metal Market Breaking the mold 10/31/2014 [www.amm.com/Article/3408253/Breaking-the-mold.html](http://www.amm.com/Article/3408253/Breaking-the-mold.html)

 Exploring the chemistry of slag from flash ironmaking. 10/16/2014. [materialsviews.com/exploring-chemistry-slag-flash-ironmaking](http://www.materialsviews.com/exploring-chemistry-slag-flash-ironmaking)

 Reducing the energy consumption of ironmaking. 10/14/2014. [materialsviews.com/reducing-energy-consumption-ironmaking/](http://www.materialsviews.com/reducing-energy-consumption-ironmaking/)

 U.S. Department of Energy 5/6-7/2014 <http://energy.gov/sites/prod/files/2014/06/f16/3-AISI_AMO_RD_Project_Peer_Review_2014.pdf>

 The Business Journal 04/07/2014. [archive.businessjournaldaily.com/company-news/no-blast-furnaces-steel-industry-still-strong-2014-4-7](http://archive.businessjournaldaily.com/company-news/no-blast-furnaces-steel-industry-still-strong-2014-4-7)

 AISI Profile 2014 p. 14 <https://www.steel.org/~/media/Files/AISI/Reports/AISI_Profile_14_FINAL.pdf>

 Architect The AIA Magazine, Feb. 2014, p. 54.

 Gulf News 2/25/2014 [gulfnews.com/gn-focus/steel/latest-trends-in-the-steel-industry-1.1294557](http://gulfnews.com/gn-focus/steel/latest-trends-in-the-steel-industry-1.1294557)

 MIND & MATTER: University of Utah Researchers Develop Greener Ironmaking. 12/26/2013. [architectmagazine.com/technology/university-of-utah-researchers-develop-greener-ironmaking\_o](http://www.architectmagazine.com/technology/university-of-utah-researchers-develop-greener-ironmaking_o)

 More ecofriendly ironmaking. 12/09/2013. [materialsviews.com/more-ecofriendly-ironmaking/](http://www.materialsviews.com/more-ecofriendly-ironmaking/)

 BlueGreen Alliance: Testimony to U. S. House of Representatives 5/21/2013 <http://docs.house.gov/meetings/IF/IF17/20130321/100543/HHRG-113-IF17-Wstate-LopesY-20130321.pdf>

 Advances in Ecology Environment and Conservation Research and Application <https://books.google.com/books?id=mkK9M9BB1SAC&pg=PA388&lpg=PA388&dq=flash+ironmaking+utah&source=bl&ots=wDwUlprZZ3&sig=rXUlJNRxJyAUhwuMGxo9KBCW0mA&hl=en&sa=X&ved=0ahUKEwjbiqm9jsvKAhUD0WMKHdBTDvY4HhDoAQgrMAM#v=onepage&q=flash%20ironmaking%20utah&f=false>

 Conserving Energy in Manufacturing 2/25/13 <file:///Z:/0-1%20AISI-DOE%20New%20Project%202012/Public%20Relations/Conserving%20Energy%20in%20Manufacturing%20%20University%20of%20Utah%20News.htm>

 Innovative Process and Materials Technologies <http://energy.gov/eere/amo/innovative-process-and-materials-technologies-0>

 Institute for Industrial Productivity 10/2012 <http://www.iipnetwork.org/IronSteelReport.pdf>

 Foundry Insight 7/2012

[pyrotek-inc.com/documents/insight\_newsletter/Foundry\_Insight\_2012-7.pdf](http://pyrotek-inc.com/documents/insight_newsletter/Foundry_Insight_2012-7.pdf)

 Green Car Congress 6/12/2012 <http://www.greencarcongress.com/2012/06/doe-20120612.html>

 Reliable Plant . 08/2008. [reliableplant.com/Read/20164/us-steelmakers-leading-green,-industrial-renaissance](http://www.reliableplant.com/Read/20164/us-steelmakers-leading-green,-industrial-renaissance)

 Steel Works . 08/2008. [steel.org/sustainability/energy-reduction/co2-breakthrough-program.aspx](http://www.steel.org/sustainability/energy-reduction/co2-breakthrough-program.aspx)

 Steel Framing Alliance 5/7/2008 [www.steelframing.org/Framework2008/Framework-05-08/FrameworkOnlineMay\_08\_industrywatch\_2.htm](http://www.steelframing.org/Framework2008/Framework-05-08/FrameworkOnlineMay_08_industrywatch_2.htm)

 Final Report DOE/AISI Suspension Hydrogen Reduction

of Iron Ore Concentrate 3/2008 <http://www.osti.gov/scitech/servlets/purl/929441>

 The New Steel 1/8/2008 [miningusa.com/sme/dc/meetings/Jan18PPT.pdf](http://www.miningusa.com/sme/dc/meetings/Jan18PPT.pdf)

 Suspension Hydrogen Reduction of Iron Oxide Concentrate 2006 <http://steeltrp.com/trpgreenbook2006/9953factsheet.pdf>

Novel Flash Ironmaking, Chemical Synthesis of Inorganic Nanomaterials, Metallurgical Process Engineering including CFD Modeling, Nonferrous metal production (especially coppermaking at high temperatures), Fluid–Solid Reaction Engineering, Synthesis and Processing of Ceramic and Intermetallic Compounds, Hydrogen Storage Materials Development, Solvent Extraction, Combustion of Solids and Liquids, Roasting for selective formation and recovery of desired minerals and phases, Impurity behavior and removal/recovery during smelting and/or refining, Reactor and process design and/or optimization of pyro/hydrometallurgical processes (using various modeling techniques such as flowsheet modeling and Computational Fluid Dynamics), Measurements and analyses of fluid-particle reaction kinetics

RESEARCH INTERESTS

Suspension Hydrogen Reduction of Iron Oxide Concentrate for Novel Ironmaking Process

CURRENT RESEARCH ACTIVITIES

In-Process Separation of Zinc from Steelmaking Off-Gas

Computational Fluid Dynamic Modeling of Flame Synthesis of Nanosized Powders

Chemical Vapor Synthesis of Nanosized/Nanostructured Intermetallic and Ceramic Compounds

Analytical Investigation of Fluid–Solid Reactions

Lawrence Livermore National Laboratory (Earth Sciences Division), 1975–89 (Oil shale processing; Gas-solid reactions)

CONSULTING ACTIVITIES

Ford, Bacon & Davis, Inc. 1976 (Metal oxide reduction in a shaft kiln)

Kennecott Copper Corporation, 1976– (Various aspects of coppermaking including minor-element behavior; Flash converting process; Improvement of Particle Feeding into Flash Furnaces; Fluidized-bed roasting process; Waste Heat Boiler Accretion)

American Chemet Corporation, 1980–81 (Heat transfer problems)

Cabot Corporation, 1984–86 (Metallurgical reactor design)

Kerr McGee Corporation, 1986–88 (Chemical reactor design/analysis; Gas-solid reactions)

Resource Recovery and Conservation Company (R2C2), 1987–88 (Mathematical analysis of pollution abatement in minerals industry)

Utah Power and Light Company, 1987–88 (Evaluation of fly ash as a resource for metal values)

E. I. du Pont de Nemours and Co., Wilmington, DE, 1987–93 (Novel reactor design and process development)

Jones, Day, Reavis & Pogue (Law Firm), Washington, DC, 1990 (Technical assistance in conjunction with a law suit involving clean-up of mineral tailings)

Newmont Metallurgical Services, 1990–93 (Oxidation of refractory gold ores)

Gypsum Resources Development Inc., 1991 (Evaluation of new limestone development)

ICF Inc., Washington, DC, 1991 (Mineral waste treatment)

Nippon Mining and Metals Co., Tokyo, Japan, 1991–93 (Particle Dispersion Phenomena in a Turbulent Gas Jet)

Outokumpu Co., Pori, Finland, 1992–97 (Nickel Extraction Processes; Copper Flash Converting)

Morton Automotive Safety Product, 1992–94 (Characterization of Automobile Airbag Gas Generant Residues)

Horsehead Research and Development Co., Monaca, Pennsylvania, 1993 (Flash reaction process in a flame reactor)

BHP Minerals, 1995 (Flash Roasting of Copper Concentrates)

ASARCO, 1997 (Solvent Extraction Process)

H. C. Starck, Inc., 1997–98 (Tantalum powder production)

Idaho National Engineering and Environmental Laboratory (INEEL) – Lockheed Martin Idaho Technologies Company (LMITCO), 1999 (Radioactive Waste Calcination Process)

Covol Technologies, Inc., 2000 (Evaluation of Processes for Treating Steel Plant Wastes)

REI (Reaction Engineering International), 2001 (Treatment of a Sludge Waste from PC Board Fabrication and Recovery of Metal Values)

Chrysalis Technologies Inc., 2000–2002 (Production of Nano-Sized Metallic and Intermetallic Powders)

Anderson Engineering Co., 2003 (Environmental Aspects of the Tooele Smelter Operations and Carr Fork Project of International Smelting and Refining Company)

Barlow Lyde & Gilbert, London, U.K., 2004-2005 (Technical assistance in conjunction with a law suit involving smelter and acid plant)

LS-Nikko Copper Inc., Ulsan, Korea, 2005 – present

China Yunnan Metallurgical Group (CYMG), Kunming, Yunnan, China, 2007 – 2008

PPP Equipment Corp., Burbank, California, 2009 – 2011 (Polysilicon production technology)

Mannheimer Swartling, Hong Kong, 2014-15 (Expert Witness in conjunction with an arbitration involving smelter and smelting technology)

Aurubis AG, Hamburg, Germany, 2017-

The Minerals, Metals and Materials Society (TMS) (Fellow) of American Institute of Mining, Metallurgical and Petroleum Engineers; Korean Academy of Science and Technology (Fellow); Korean Scientists and Engineers Association; Formerly - Association for Iron & Steel Technology (AIST); Society of Mining Engineers; American Institute of Chemical Engineers; American Ceramic Society; American Chemical Society; Korean Institute of Chemical Engineers; North American Thermal Analysis Society; Sigma Xi; California Catalysis Society; Philadelphia Catalysis Society

TECHNICAL AND PROFESSIONAL SOCIETY MEMBERSHIPS:

**The Minerals. Metals and Materials Society of AIME (TMS–AIME)**

TECHNICAL AND PROFESSIONAL SOCIETY ACTIVITIES:

**Director**: Board of Directors, 1983–84

**Fellows Award** Committee, 2009-2013

Metallurgical and Materials Transactions B Review Committee (formerly Publication Committee), 1976–93

Metallurgical and Materials Transactions Board of Review, 1976–93

Vice Chairman: Extractive and Process Metallurgy, Program Committee, 1982–1985

**AIME** Rossiter W. Raymond Memorial Award and Alfred Noble Nominating Committee, 1985–87; 2007-09

President's Ad Hoc Committee on Programming Activities, 1982

Ad Hoc Committee on Programming Review and Awards, 1983–84

Member: Strategic Management Team (Education of Future Professionals), 1992–93

Book Review and Publishing Committee, 1985–88

Member: Extraction and Processing Division Council, 1995 – 1999

Chairman: EPD Judging Committee for TMS Presidential Scholarship, 1995

Chairman: Judging Committee for EPD Scholarships, 1995–99

Chairman: Student Affairs Committee, 1992–1994; Vice Chairman, 1990–92; EPD representative, 1995–99; member, 1987 (Featured in JOM, March 1997)

Process Fundamentals Committee (formerly Physical Chemistry of Extractive Metallurgy Committee), 1975– (Chairman, 1979–80)

Pyrometallurgy Committee, 1989–

Continuing Education Committee, 1989–90

Reactive Metals Committee, 1990–

International Activities Committee, 1991–93

Process Technology & Modeling Committee, 1995 – 1999

Membership Development Committee, 1992–94

Member: The First EPD Scholar Selection Committee, 1992

Member: JOM Advisory Board on Pyrometallurgy, 1993–96

Member, Energy Committee, 2014-

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Contributor to the Journal of Metals Annual Review of Extractive and Process Metallurgy (Topic: Development in Physical Chemistry and Basic Principles), 1976–1998

Local Sections and Student Chapters Speaker, 1983

Evaluator of 1985 TMS–AIME Graduate and Undergraduate Paper Contest

Judge, TMS/ASM Chapter of Excellence Contest, 1993

Featured in “A Professional in Portrait,” JOM September 1994 issue.

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● Symposium Co–Chairman (with O. N. Carlson and J. T. Smith): Extractive Metallurgy of Refractory Metals (5 sessions), AIME Annual Meeting, Chicago, Illinois, February 24–26, 1981.

● General Meeting Chairman: 1983 TMS–AIME Extractive and Process Metallurgy First Fall Meeting and International Sulfide Smelting Symposium (13 sessions), San Francisco, California, November 6–9, 1983.

● Symposium Co–Chairman (with P. R. Taylor and N. Jarrett): 1985 TMS–AIME Extractive and Process Metallurgy Fall Meeting and International Symposium on Recycle and Secondary Metals (11 sessions), Fort Lauderdale, Florida, December 1–4, 1985.

● Symposium Chairman (with E. S. Geskin): International Symposium on Metallurgical Processes for the Year 2000 and Beyond (11 sessions), Las Vegas, Nevada, February 27–March 1, 1989.

● General Meeting Chairman: 1994 TMS Extractive and Process Metallurgy Fall Meeting and 2nd International Symposium on Metallurgical Processes for the Year 2000 and Beyond, San Diego, September 20–23, 1994.

● Program Chairman: The Julian Szekely Memorial Symposium on Materials Processing, The 1997 TMS Fall Extraction and Processing Conference, Cambridge, Massachusetts, October 5–8, 1997.

● General Meeting Chairman (with W. D. Cho): International Symposium on Value–Addition Metallurgy, San Antonio, Texas, February 15–19, 1998.

● Organizing Committee: International Symposium on Computational Modeling of Materials, Minerals, and Metals Processing – Seattle, Washington, February 17-21, 2002.

● Symposium Co–Chairman (with R. L. Stephens): Third International Sulfide Smelting Symposium: Sulfide Smelting ’02, Seattle, Washington, February 17-21, 2002.

● Short Course Instructor: H.Y. Sohn, K. Itagaki, and F. Kongoli, “Sulfide Smelting: Principles, Technologies, and Environmental Considerations,” in Conjunction with 132nd TMS Annual Meeting, San Diego, California, March 1-2, 2003.

● Symposium Chairman (H. Y. Sohn, K. Itagaki, C. Yamauchi and F. Kongoli): Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies (30 sessions), 132nd TMS Annual Meeting, San Diego, California, March 2-6, 2003.

● Co-organizer (with J.-Y. Hwang and Others), 6th International Symposium on High Temperature Metallurgical Processing, 144th TMS Annual Meeting, Orlando, Florida, March 15-19, 2015.

**American Institute of Chemical Engineers (AIChE)**

Member: AIChE Journal Review Board, 1977

Symposium Chairman: Extraction and Processing of Energy and Metal Minerals (3 sessions), AIChE Meeting, Houston, Texas, April 7–8, 1981.

Symposium Chairman: Metals and Minerals Processing (3 sessions), AIChE Meeting, Denver, Colorado, August 28–31, 1983.

Symposium Chairman: Recovery of Metal Values from Industrial Wastes (2 sessions), AIChE Meeting, Denver, Colorado, August 28–31, 1983.

**Society of Mining Engineers of AIME (SME–AIME)**

**Founding Chairman**: Pyrometallurgical Processing Committee, 1987–89.

Member: General Committee, Mineral and Metallurgical Processing Division, 1987–89.

Member: Program Committee, Mineral and Metallurgical Processing Division, 1987–89.

**Other Societies**

President: Intermountain States Chapter, The Korean Scientists and Engineers Association in America, 1975

Member: Editorial Board, Korean Journal of Chemical Engineering, 1983 – 1987

Evaluator for Student Paper Prize, Rocky Mountain Fuel Society, 1984.

National Research Council Review Panelist, 1989

Fellow: Korean Academy of Science and Technology (1997-)

Distinguished Member: Technical Program Committee, International Conference on Nanotechnology and PM2: Scientific Challenges & Commercial Opportunities, Metal Powder Industries Federation, September 17 – 18, 2003.

**Journal Editorial**

OTHER PROFESSIONAL ACTIVITIES:

Metallurgical Transaction B Board of Review, 1976–93

Editorial Board, Korean J. of Chemical Engineering, 1983 – 1987.

Associate Editor: In Situ, 1986–present; Member of Editorial Board, In Situ, 1984–86

International Advisory Board, Metals and Materials International, 1995-2007.

Editorial Advisor, Recent Research Developments in Materials and Metallurgical Sciences, 1996–

International Editorial Board, Journal of Mining and Metallurgy, 1997-

International Editorial Board, High Temperature Materials and Processes, 2002-

International Editorial Board, The Chinese Journal of Nonferrous Metals, 2002-

International Editorial Board, Transactions of Nonferrous Metals Society of China, 2002-

Editorial Board, Metals, 2020-

Co-Editor-in-Chief, Treatise on Process Metallurgy, 2nd ed., Elsevier, 2020-

**Panel/Group**

Member: U.S. Department of Energy Oil Shale Mathematical Modeling Group, 1977–81

Member: U.S. Department of Energy Review Panel for Energy Research Manpower Development Programs at Educational Institutions, 1979–81.

Sole External Reviewer of Metallurgical Engineering Program of the University of Nevada–Reno, December 1983

Panelist: 1987 TMS Extractive and Process Metallurgy Fall Meeting, “The Mathematical Modeling of Metals Processing Operations,” Nov. 29–Dec. 2, 1987, Palm Springs, California

Review Panelist for National Research Council on Fellowship and Assistantship Program, 1989

Review Panelist: National Science Foundation Graduate Research Fellowship Program, 2001- 2003

Review Panelist: National Science Foundation Small Business Programs, Advanced Materials, Manufacturing, and Chemical Processes (SBIR/STTR), Powder Material Processing proposals review, 2004

**Invited Lecture/Participation** (Plenary & Keynote Lecture are listed above: Other Invited Talks at conferences are listed separately below.)

● Invited Participant at the Darken Conference sponsored by U.S. Steel Corp., honoring Dr. Lawrence S. Darken, Monroeville, Pennsylvania, August 23–25, 1976.

● Invited Speaker at the 4th International Conference, “Physical Chemistry and Steelmaking 1978,” Versailles, France, October 23 – 25, 1978.

● Invited Instructor of a graduate short course on “Gas–Solid Reactions,” Department of Chemical Engineering, Korea Advanced Institute of Science, Seoul, Korea, 1980.

● Speaker on Oil Shale Resources on an Instructional TV Program “Utah Geography,” 1982.

● Lecturer at various universities and research organizations invited by Chinese Government, 1982.

● Invited Speaker at the Japan–U.S. Seminar on Advances in the Science of Iron- and Steelmaking, Kyoto, Japan, May 16–20, 1983.

● Invited Lecturer, The Second National Symposium of Metallurgical Engineering, Lima, Peru, November 14–19, 1983.

● Invited Instructor of a graduate short course on “Fluid–Solid Reaction Engineering,” Department of Chemical Engineering, Chunnam National University, Kwangju, Korea, 1987.

● Organization of American States Lecturer: Universidad Central de Venezuela, Caracas, Venezuela, March 14–25, 1988; offered a course on “Direct Reduction of Iron Ore: Process Principles and Practice”.

● Lecturer at various universities and research organizations invited by Chinese Government, 1989.

● Delivered a series of lectures at CSIRO and Monash University in Melbourne, Australia and the University of Auckland, Auckland, New Zealand, May 9–18, 1989.

● Japan Society for the Promotion of Science (Japanese Government) Fellow for research and lecture in Japan, 1990.

● Invited Speaker on Mineral Industry Waste Treatment at an EPA-sponsored Workshop, Washington, D.C., December 5, 1991.

● Invited lecturer at various industrial, academic and government organizations in Chile, 1994 and 1995.

● Invited Instructor of a graduate short course on “Heterogeneous Kinetics”, Royal Institute of Technology, Stockholm, Sweden, 1996.

● Invited lecturer and adviser at RESCWE (Research Center for Advanced Waste and Emission Management) of Nagoya University for lecturing and research discussion (including visits to Kyoto Univ., Chiba Inst. of Tech. and Tohoku Univ.), May 2000 and May 2001.

● Invited Speaker at the Szekely/Muchi Symposium on Materials Processing, Nagoya, Japan, June 2001.

● Invited Instructor of a short course “The Principles and Practice of High-Temperature Chemical Metallurgy,” under the auspices of Andes Foundation at the University of Concepcion, Concepcion, Chile, September 9 – 12, 2002.

● School of Metallurgical Science and Engineering, Central South University, Changsha, Hunan, China, November 6, 2006.

● Invited lecturer at Nagoya University and Kyoto University, November 2006.

● Invited lecturer at Central Metallurgical R&D Inst., Cairo, Egypt, March 19-23, 2007.

● Invited Instructor of a short course “**Metallurgical Process Principles and Practices – Silicon production and processing, Titanium extraction,** Thermodynamic principles of high-temperature extraction processes, Sulfide smelting and converting, Basic principles of heterogeneous reaction rate analysis,” China Yunnan Metallurgical Group (CYMG), Kunming, Yunnan, China, May 9 – 11, 2007.

● Invited Speaker, Workshop on Carbon Management in Manufacturing Industries, GCEP, Stanford University, Stanford, California, April 15-16, 2008.

● Invited Speaker, 3rd Annual AISI Environmental Briefing on Capitol Hill, April 21, 2008.

● Invited Speaker, 2008 AISI General Meeting, Scottsdale, Arizona, May 4-6, 2008.

● Invited Speaker, International Iron and Steel Inst. (IISI) CO2 Breakthrough Programme Meeting, Oita, Japan, September 4-5, 2008.

● Hungarian Academy of Sciences - Institute of Isotopes, Budapest, Hungary, March 19, 2009.

● Vienna University of Technology, Institute of Chemical Engineering, Vienna, Austria, March 23, 2009.

● Technical University Košice, Košice, Slovakia, March 26, 2009.

● Invited Speaker, Asia-Pacific Partnership Meetings in conjunction with AISTech 2009, May 4 – 7, 2009.

● School of Metallurgical Science and Engineering and School of Mineral Processing and Extractive Metallurgy, Central South University, Changsha, Hunan, China, October 13, 2009.

● School of Materials Science & Engineering, Shanghai Jiao Tong University, Shanghai, China, October 19, 2009.

● Invited Speaker, “Bridging Different Disciplines in Process Metallurgy and Materials Synthesis,” Symposium on the Production and Application of Nonferrous Metals, The Korean Institute of Metals and Materials, Seoul, Korea, August 9, 2011.

● Invited Speaker, RIST, Korea, August 16, 2011.

● Invited Speaker, GIFT-POSTECH, Pohang, Korea, August 17, 2011.

● Invited Speaker, LS-Nikko Co., Ulsan, Korea, August 18, 2011.

● Invited Speaker, International Symposium on EAF Dust Treatment in conjunction with Iron Steel Inst. Japan (ISIJ) 2012 Annual Meeting, Yokohama, Japan, March 20, 2012.

● Invited Speaker, 3 talks, First International Metallurgy Meeting, Lima, Peru, October 26-27, 2012.

● Invited Speaker, “Novel Flash Ironmaking Technology,” Matoba Memorial Kawatabi Seminar (Japanese equivalent to Gordon Conferences), Sendai, Japan, August 22-23, 2013.

**Conference/Short Course Organization (excluding those through professional societies separately listed above)**

● Short Course Director (with M. E. Wadsworth), Rate Processes of Extractive Metallurgy, Short Course held at the University of Utah, December 18–20, 1975.

● Organizer, Heterogeneous Reactions, 1978 Engineering Foundation Conference on Particle Science and Engineering in the Process Industries, Asilomar Conference Grounds, Pacific Grove, California, June 18–23, 1978.

● Conference Co–Chairman (with D. G. C. Robertson): 1986 Center for Pyrometallurgy Conference on Gas–Solid Reactions in Pyrometallurgy (4 sessions), West Lafayette, Indiana, April 24–25, 1986.

● Conference Co–Chairman (with D. G. C. Robertson and N. J. Themelis): Center for Pyrometallurgy Conference on Flash Reaction Processes (4 sessions) Salt Lake City, Utah June 15–17 1988.

● Member, Organizing Committee, St. Petersburg International Symposium on Complex Ore Utilization, May 10–20, 1994.

● Co–Organizer, NATO Advanced Research Workshop on Flash Reaction Processes, Istanbul, Turkey, May 6–9, 1994.

● International Advisory Panel, The Third International Conference on Hydrometallurgy (ICHM '98), Kunming, China, November 3–5, 1998.

● Short Course Instructor: “Environmentally Driven New Technologies: Primary Copper Industry,” in conjunction with Global Symposium on Recycling, Waste Treatment and Clean Technology, TMS Fall 1999 Extraction and Process Metallurgy Meeting, San Sebastian, Spain, September 5–9, 1999.

● External Member of Organizing Committee (Australasian Institute of Mining and Metallurgy), MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia, September 11–13, 2000.

● Short Course Instructor: H.Y. Sohn and N.J. Themelis, “Sulphide Smelting: Principles, Practice, New Technologies and Environmental Considerations,” in Conjunction with MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia,, September 9-10, 2000.

● Advisory Board: Conference on Processing of Complex Mineral Resources, Almaty, Kazakhstan, October 11-13, 2000.

● Conference Co–Chairman (with S. Asai), Szekely/Muchi Symposium on Materials Processing, Nagoya, Japan, June 2001.

● International Advisory Board, International Conference on Advances in Materials and Materials Processing (ICAMMP), Kharagpur, India, February 1-3, 2002.

● Short Course Instructor: H.Y. Sohn, K. Itagaki, and F. Kongoli, “Sulfide Smelting: Principles, Technologies, and Environmental Considerations,” in Conjunction with 132nd TMS Annual Meeting, San Diego, California, March 1-2, 2003.

● Program Committee: 2003 International Conference on Nanotechnology & PM2: Scientific Challenges & Commercial Opportunities, Providence, Rhode Island, September 17-18, 2003.

● International Advisory Board, Fourth International Congress on the Science and Technology of Ironmaking (ICSTI ’06), Osaka, Japan, November 26-30, 2006.

● Symposium Advisory Committee, Advanced Materials Technology (AMT) Symposium for Automotive, Aerospace, Energy, and Ship Building Applications, Teaneck, New Jersey, August 10-13, 2006.

● Advisory Committee, ’06 International Conference on Agglomeration of Iron Ores, Changsha, Hunan, China, November 3-6, 2006.

● Advisory Committee, Molten 2008 (The 8th International Conference on Molten, Slags, Fluxes and Salts), Santiago, Chile, Oct. 19-22, 2008.

● International Committee, International Conference on the Advances in Theory of Ironmaking and Steelmaking (ATIS-2009), Indian Institute of Science, Bangalore, India, 9-11 December, 2009.

● International Advisory Committee, International Conference on Advances in Materials and Materials Processing (ICAMMP), Kharagpur, India, December 2010.

● International Advisory Board, 6th International Congress on Science and Technology of Ironmaking - ICSTI 12, Rio de Janeiro, Brazil, October 2012.

● Short Course Instructor: “Copper Smelting and Converting: Principles and Practice,” in conjunction with First Metallurgical Meeting, Lima, Peru, October 24, 2012.

● Short Course Instructor: “Ironmaking Technologies: Issues and New Development,” in conjunction with First Metallurgical Meeting, Lima, Peru, October 24, 2012.

● Scientific Committee, 1st International Conference on Mining, Material and Metallurgical Engineering (MMME'14), Prague, Czech Republic, August 2014.

● International Advisory Board, 2nd International Conference on Advanced Basic & Applied Sciences (ABAS), Ain Sokhna, Egypt, April 2 – 4, 2014.

● Scientific Committee, 2nd International Conference on Mining, Material and Metallurgical Engineering (MMME'15), Barcelona, Spain, July 20-21, 2015.

● International Advisory Committee, 10th International Conference on Molten Slags, Fluxes, and Salts, Seattle, Washington, May 22–25, 2016.

● Scientific Committee, 3rd International Conference on Mining, Material and Metallurgical Engineering (MMME'16), Budapest, Hungary, August 2016.

● Scientific Committee, 4th International Conference on Mining, Material and Metallurgical Engineering (MMME'17), Rome, Italy, June 9 – 10, 2017.

● Scientific Committee, 5th International Conference on Mining, Material and Metallurgical Engineering (MMME'18), Madrid, Spain, August 16 - 18, 2018.

● Scientific Committee, 6th International Conference on Mining, Material and Metallurgical Engineering (MMME'19), Lisbon, Portugal, August 15 - 17, 2019.

● Co-Chair, Poveromo International Symposium on Sustainable Iron and Steel Making, Phuket, Thailand, November 29 - December 3, 2020.

● Scientific Committee, International Conference on Mining, Material and Metallurgical Engineering (MMME'20-'22), 2019 – 2022.

**International Dissertation/Thesis Examination**

● External Examiner of Ph.D. Dissertation, Department of Metallurgical Engineering, Sambalpur University, Sambalpur, India, 1985.

● Ph.D. Dissertation (Mansoor M. Hussain, Kinetics and Simulation of Lead Blast Furnace), Department of Chemical Engineering, University of New Brunswick, Canada, 1986–87.

● Ph.D. Dissertation (V. Manuel Zamalloa, Smelting Mechanisms of Roasted Ni–Cu Concentrates), Department of Metallurgy and Materials Science, University of Toronto, Toronto, Ontario, Canada, 1995.

● M.S. Thesis (Donald N. Collins, Reactions in the Shaft of the Olympic Dam Flash Furnace), Department of Chemical Engineering, University of Melbourne, Australia, 1995.

● Ph.D. Dissertation (Anthony C. Chamberlain, The Effect of Stoichiometry on the Thermal Behaviour of Synthetic Iron–Nickel Sulfides), School of Applied Chemistry, Curtin Univ. of Tech., Perth, Australia, 1997.

● Ph.D. Dissertation (Mark Dell'Amico, A Study of Reactions between Pyrrhotites and Sulphur Dioxide and Its Implications for the Recovery of Sulphur from Flue Gases), Department of Chemical Engineering, University of Melbourne, Australia, 1997.

● Ph.D. Dissertation (Christopher J. Crowe, Gaseous Reduction of Nickel Calcines in H2 and CO between 400°C and 850°C), Department of Metallurgy and Materials Science, University of Toronto, Toronto, Ontario, Canada, 1998.

● M.S. (Metallurgy) Thesis (Alistair Stewart Burrows, Copper Loss in the Rotary Holding Furnace), School of Science, University of Ballarat, Ballarat, Victoria, Australia, 1999.

● Master of Engineering Dissertation (Johannes Theodorus Ferreira Le Roux, Fluidised-Bed Chlorination of Titania Slag), Faculty of Engineering, Built Environment & Information Technology, University of Pretoria, Pretoria, Republic of South Africa, 2001.

● Ph.D. Dissertation (Liming Lu, Coal/Char Structure and Its Influence on Char/Gas Reactions during Pulverized Coal Injection in Blast Furnace), School of Materials Science and Engineering, University of New South Wales, Sydney, Australia, 2001.

● Ph.D. Dissertation (David Debrincat, Dispersion of Solid Charge in a Flash Furnace), Department of Chemical Engineering, University of Melbourne, Melbourne, Australia, 2002.

● Invited *Opponent* of Ph.D. Dissertation Defense (Ricardo Morales, Hydrogen Reduction Route towards the Production of Nano-Grained Alloys – Synthesis and Characterization of Fe2Mo Powder), Department of Materials Science and Engineering, Royal Institute of Technology, Stockholm, Sweden, 2002.

● M.S. (Metallurgy) Dissertation (Peter Ndula Bungu, Fluidized-Bed Chlorination of Oxidized Titania Slag), Faculty of Engineering, Built Environment & Information Technology, University of Pretoria, Pretoria, Republic of South Africa, 2004.

● M.S. (Chemistry) Thesis (Ahmed Sobhy Abdel-Fattah Sayed Ahmed, Upgrading of Egyptian Celestite Ores for Different Industrial Applications), Chemistry Department, Faculty of Science, Cairo University, 2008.

● Ph.D. Dissertation (Harjinder Singh, Synthesis and Characterization of Nano Tungsten Carbide from Ores), School of Physics and Materials Science Thapar University, Patiala, India, 2013.

● M.S. (Chemistry) Thesis (Ahmed Hamdy Mohammed El Menshawy, Desulfurization of El Maghara Coal by Advanced Techniqiques), Chemistry Department, Faculty of Science, Cairo University, 2015.

● Ph.D. Dissertation (Kali Charan Sabat, Production of Metals and Alloys from Their Oxides Through Low Temperature Hydrogen Plasma Reduction), School of Mechanical Engineering, KIIT University, Bhubaneswar, India, 2015.

● Ph.D. Dissertation (Sigit Prabowo, Reduction of New Zealand Titanomagnetite Ironsand by Hydrogen Gas in a Fluidised Bed System), jointly Victoria University of Wellington, Wellington, New Zealand and University of Wollongong, NSW, Australia, 2020.

**Other Activities**

Principal Host of Chinese Scholar (Li Zhenjia) under the Distinguished Scholar Exchange Program sponsored by National Academy of Sciences, 1982.

Featured Interviewee in “Mineral Processing in the Early 21st Century,” Outokumpu News, No. 1/95, pp. 4–8, June 1995.

Featured in “Steel’s Green Future,” Metal Bulletin Monthly, p.34, January 2009.

Advisor, LS-Nikko Copper Inc., Ulsan, Korea, 2005 – present

Advisor, Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon, Korea, 2010 – present

Official Nominator, VinFuture Prize, Jan. 2024-. <https://vinfutureprize.org/>

COURSES Met.E. 366/166: Introduction to Extractive Metallurgy

TAUGHT Ch.E./F.E./Met. E. 311: Fundamentals of Process Engineering

Met.E. 3220/320: Material and Energy Balances

Met.E. 562: Metallurgical Thermodynamics

Met.E. 5710/6710: High-Temperature Chemical Processing

Met.E. 5750/6750 (575): Rate Processes

Met.E. 6250 (625): Fundamentals of Engineering Analysis

Met.E. 6350 (645): Transport Phenomena (formerly Transport Phenomena in Process Metallurgy I)

Met.E. 7460 (646): Advanced Fluid–Solid Reaction Engineering (formerly Transport Phenomena in Process Metallurgy II)

Met.E. 6800: Graduate Seminar

Faculty Advisor for Juniors and Seniors 1979–97

**University Graduate Council,** 2013-2016.

UNIVERSITY COMMITTEE ACTIVITIES (excluding most Departmental committees)

**University Promotion and Tenure Advisory Committee**, 1993, 1994–97.

**University Principal Investigators' Monthly Meeting Participant** (advisory to Vice President for Research), 1980–82, 1986–92.

**University Research Committee**, 1990–93 (Member, Faculty Fellow Award Subcommittee; Member, Graduate Research Fellowship Subcommittee).

**University Faculty Hearing Committee,** 2001–2004.

**University Academic Freedom and Tenure Committee,** 2000–02.

**University Discrimination Complaints Hearing Panel**, 1997–00.

University **Academic Evaluation and Standards Committee**, 1986–88.

University **Patent Review** Committee, 1981–84.

Member, **Task Force on Academic Organization**, University of Utah, 1993.

**University International Exchange Committee,** 2008–12

University **Credits and Admissions** Committee, 1979–81.

**University Campus Recreation Committee,** 2006–09.

Lead the University Team to establish a sisterhood relationship with Ajou University, Korea, 1997.

Established student-exchange program between the University of Utah and the Royal Institute of Technology, Stockholm, Sweden, 1995.

The Garr Cutler Energy Award Committee, University of Utah, 1992–93.

University **Ad Hoc Committee** to Investigate Claims to the **Invention of the Artificial Heart**, September 1983–March 1984.

University Graduate Studies Committee of the Process Engineering and Materials Division, 1975–80.

**College of Health** **Academic Appeals and Misconduct** Committee, 2005–08.

College of Mines and Earth Sciences **College Council**, 1977–79; 1981–83; 1990–92 (Scholarship/Proselyting Committee); 2006–08; 2020–.

College of Mines and Earth Sciences Faculty Relations Committee, 1978–80; 1982–84; Chair, 1986–88; 1989–91 (Chair, 1990–91); Chair, 1997–99; 2002–04; 2006–08 (Chair, 2007-08); 2012–14; 2016–present.

Chairman, College of Mines and Mineral Industries Curriculum Committee, 1979–80, 1982–83; member 1982–87.

College of Mines and Earth Sciences Teaching Award Committee, 1982–83; Chairman, 1987–88; 1995–96; 2004–06.

College of Mines and Earth Sciences Loan Committee, 2008–10

College of Mines and Earth Sciences Centennial Committee, 1990–91 (Moderator: Session on College Accomplishments, 10/91).

Lead the initiative on behalf of the University of Utah for Cultural, Educational and Scientific Cooperation between the Department of Metallurgical Engineering and the Institute for Advanced Materials Processing, Tohoku University, Sendai, Japan, 1999.

Chair and External Member, Tenured Faculty Evaluation Committee, Department of Mining Engineering, 1999.

External Member, Retention, Promotion and Tenure Committee, Department of Mining Engineering, 1999–00; 2001–02.

Chair, Retention, Promotion and Tenure Committee, Department of Metallurgical Engineering, 1999–2015.

Director, Graduate Studies, Department of Metallurgical Engineering, 1997–2018.

Faculty Advisor, Undergraduate Studies, Department of Metallurgical Engineering, 1979–97.

President (1984) and Vice President (1980), Korean–American Society of Utah. Director, Korean–American Society of Utah, 1981–85. Principal, Korean–American Community School of Utah, 1980–82. Director, Korean–American Community School of Utah, 1979. Advisor, Korean Student Association, University of Utah, 1983–87; 1989–90; 1999-2009. Director, Asian Association of Utah, Board of Directors, 1984–85. Member, Utah State Governor's Advisory Council, 1985–89; Vice–Chairman, 1988–89. President, The Seoul National University Alumni Association of Utah, 1996–97. Vice President, The Korean–American University Professors Association in the U.S., 1997–98.

COMMUNITY

ACTIVITIES

**GRANTS AND CONTRACTS**

## **A. Federal Agencies**

1. National Aeronautics and Space Administration (NASA), Big Idea Challenge 2023 “**Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR)**,” $176,310.17, March 2023 – May 2024.
2. U.S. Department of Energy, Cooperative Agreement DE-EE0005751, with cost share by American Iron & Steel Institute and the University of Utah, **“A Novel Flash Ironmaking Process,” $10,600,000,** June 2012 - August 2018.
3. NSF/U.S.-Egypt Joint Science and Technology Board, Grant No. IIA-1445577, “Plasma-Assisted Chemical Vapor Synthesis versus Conventional Synthesis Methods of Advanced Ceramic Nanopowders” (with Prof. M. H. Khedr of Beni-Suef University), $201,011 ($112,211 to the University of Utah), October 1 , 2014 - September 30, 2017.
4. U.S. Department of Energy, Cooperative Agreement No. DE-FC36-04GO14041, **“Development of bulk, Nanocrystalline Cemented Tungsten Carbide for Industrial Applications”** (with Z. Fang, University of Utah), **$1,962, 814** (DOE $1,262,814; University of Utah $95,000; Industry $605,000), April 1, 2004 – September 30, 2008.
5. U.S. Department of Energy, Cooperative Agreement No. DE-FC36-05GO15069, **“Chemical Vapor Synthesis of Nanocrystalline Binary and Complex Metal Hydrides for Reversible Hydrogen Storage”** (with Z. Fang, University of Utah), **$1,399,844** (DOE $795,438; University of Utah $165,000), March 1, 2005 - February 26, 2010.
6. U.S. Department of Energy, Contract DE-FC36-971D13554, with cost share by American Iron & Steel Institute, **“Suspension Hydrogen Reduction of Iron Oxide Concentrate,” $489,051,** February 23, 2005 - December 31, 2007.
7. U.S. Department of Energy, Contract No. DE–AS03–78 ET 13095 (Formerly ET–77–S–03–1760, originally ERDA Contract No. EF77–S04–3909), “**An Investigation of Factors Affecting the In–Situ Retorting of Oil Shale,” $239,180,** March 1, 1977 – September 30, 1980.
8. National Science Foundation, Grant No. CPE–8204280, “**A Fundamental Study of Flash Smelting Processes,” $213,485,** April 15, 1982 – December 31, 1985.
9. U.S. Bureau of Mines through the Generic Mineral Technology Center for Pyrometallurgy, Grant No. MU–USDI–G1125129–Utah Project No. 4951, “Experimental Investigation and Mathematical Modeling of Flash Reaction Processes,” **$190,670,** October 1, 1985 – March 31, 1990.
10. U.S. Bureau of Mines through the Generic Mineral Technology Center for Pyrometallurgy, Grant No. MU–USDI–G1125129–4953, **“Pyrometallurgical Production of Intermetallic Compounds by Vapor–Phase Coreduction of Metal Chlorides,” $210,096,** October 1, 1990 – September 30, 1993.
11. U.S. Bureau of Mines through the Generic Mineral Technology Center for Pyrometallurgy, Grant No. MU–USDI–G1125129–4954, **“Measurement of Drop Size Distribution in Liquid–Liquid Emulsions Formed by High Velocity Gas Injection,” $215,937,** October 1, 1990 – September 30, 1993.
12. U.S. Department of Energy, Cooperative Agreement No. DE-FG26-05NT42529, “Novel Nanocrystalline Intermetallic Coatings for Metal Alloys in Coal-Fired Environments” (with Z. Fang, University of Utah), **$226,903,** September 1, 2005 - August 31, 2008.
13. National Science Foundation, Grant No. IIP-0832700 “**Collaborative Research Center for Fundamental Studies of Advanced Sustainable Iron and Steel,” $112,000, October 1, 2008 – September 30, 2010.** <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0832700>.

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1. National Science Foundation, Grant ENG75–13085, “Treatment of Sulfide Ores with Steam to Produce Metal Oxides without Emitting Sulfur–Containing Pollutants,” $61,200, October 1, 1975 – March 31, 1978.
2. Laramie Energy Research Center, PL64101, “Shale Oil From Oil Shale,” $9,880, August 1976 – February 1977.
3. National Science Foundation, International Travel Grant No. DMR7806912, to deliver an invited talk at the 4th International Conference, “Physical Chemistry and Steelmaking 1978,” Versailles, France, October 23 – 25, 1978, $975.
4. U.S. Department of Energy, Laramie Energy Technology Center, Contract No. DE–AC–20–79LC10077, “The Relationship between the Optical Activity and the Degree of Degradation of Shale Oil,” $59,721, March 15, 1979 – October 15, 1981.
5. U.S. Department of Interior, Grant No. G5195049, “The Use of Coal Wastes for the Production of Alumina,” $29,825, September 30, 1979 – March 29, 1981.
6. U.S. Department of Interior, Grant No. G5195047, “Modeling of Solution Mining Systems for Deep Mineral Resources Recovery” (with M.E. Wadsworth), $71,138, September 30, 1979 – March 29, 1981.
7. Utah Consortium for Energy Research and Education (U.S. Department of Energy Discretionary Funds for Exploratory Research, Award No. 29270, “The Hybrid Retorting of Oil Shale and Coal To Produce Liquid Fuels,” $9,920, April 1, 1981.
8. U.S. Department of Interior, Grant No. G1105089, “The Use of Coal Wastes for the Production of Alumina,” $57,753, September 30, 1980 – March 29, 1982.
9. U.S. Department of Interior, Grant No. G1105088, “Modeling of Solution Mining Systems for Deep Mineral Resources Recovery” (with M.E. Wadsworth), $66,415, September 30, 1980 – March 29, 1982.
10. U.S. Department of Interior, Grant No. G1115493, “The Use of Coal Wastes for the Production of Alumina,” $33,036, September 30, 1981 – September 29, 1983.
11. U.S. Department of Interior, Grant No. G1115494, “Modeling of Solution Mining Systems for Deep Mineral Resources Recovery” (with M. E. Wadsworth), $53,390, September 30, 1981 – September 29, 1982.
12. National Science Foundation Grant No. CPE–8019689, “Thermodynamics of Ternary Alloys and Mattes Relevant to New Copper Smelting” (Substituting for M. Nagamori), $108,044, February 15, 1981 – July 31, 1983.
13. National Science Foundation, Grant No. INT 82–11631, “Chlorination of Titanium Minerals and Fractional Condensation,” $10,600, March 1, 1984 – February 28, 1986.
14. Fulbright Commission Distinguished Lecturer Grant for travel to Lima, Cuzco, and Arequipa, Peru, November 14 – 25, 1983.
15. U.S. Department of Energy, Battelle Pacific Northwest National Laboratory, Innovative Concepts Program, No. 316725–A–U4, “Titanium and Titanium Aluminide Powders by the Flash Reduction of Titanium Chloride Vapor or Titanium Chloride/Aluminum Chloride Vapor Mixture,” $21,939, August 6, 1997 – February 15, 1998.
16. NSF/U.S.-Egypt Joint Science and Technology Board, Grant No. ENV7-004-006, “A New Process for Converting SO2 to Sulfur without Generating Secondary Pollutants through Reactions with CaS/CaSO4 Pellets” (with Yasser M. Z. Ahmed, Central Metallurgical R&D Inst.), $59,982, September 1, 2003 - September 1, 2006.
17. U.S. Civilian Research and Development Foundation, Project No. 12674, Award #AE2-2526-KA-03, “New Technology for Treatment of Molybdenum Sulfide Concentrates” (with Navro LLC of Armenia), $80,000, 2003 - 2006.
18. NSF/U.S.-Egypt Joint Science and Technology Board, Grant No. MAN9-006-003/OISE 0512520, “Metallic Iron Whiskers Growth During the Reduction of Iron Oxide” (with Dr. Mahmoud I. Nasr, Central Metallurgical R&D Inst.), $57,000, September 1, 2005 - August 31, 2008.
19. National Science Foundation, Grant No. IIP-0733890, “Collaborative Research Center for Fundamental Studies of Advanced Sustainable Iron and Steel,” $10,000, September 1, 2007 – August 31, 2008.
20. NSF/U.S.-Egypt Joint Science and Technology Board, Grant No. OISE 0913513/MAN10011354-F1, “Preparation of High-Aspect Ratio Wollastonite Using Recycled Material,” $50,000, July 1, 2009 – June 30, 2012.

**B. Industry/Private Foundations**

1. **ArceloMittal $460,000, “Formation Mechanism and Kinetics of Zinc Ferrite (ZnFe2O4) in EAF Offgas**,” December 2019 – October 2023.
2. **Reaction Engineering International (REI), “Rare Earth Elements,” $99,500,** March 1, 2016 – Aug. 31, 2017.
3. **ArceloMittal $330,000, “Aerosol dynamics of zinc fume in steelmaking off-gas cleaning systems**,” June 2010 – May 2014.
4. **American Iron & Steel Institute, “Gas-Solid Suspension Ironmaking Technology,” $4,200,000 ($2,493,078 to U. of Utah plus $2,300,000 for bench reactor directly paid for by AISI),** January 1, 2008 – December 31, 2011.
5. **Chrysalis Technologies Inc., “Chemical Vapor Synthesis of Intermetallic Compounds,” $1,127,882,** July 1, 2001-June 30, 2003.
6. **BP Minerals America/State of Utah, “Center of Excellence for Advanced Pyrometallurgical Technology,” $1,661,475** including matching funds ($350,480 State funds), July 1, 1988–June 30, 1990.
7. **American Iron & Steel Institute / U.S. Department of Energy, Contract DE-FC 36-971D13554, “Suspension Hydrogen Reduction of Iron Oxide Concentrate,” $489,051,** February 23, 2005 - December 31, 2007.
8. **LS-Nikko, unrestricted grant, “Cold Model Tests for Improved Design of Mitsubishi Furnace Lances,” $320,000,** February 2007 – August 2009.
9. **ArcelorMittal Co.,** “Aerosol dynamics of zinc fume in steelmaking off-gas cleaning systems,” $365,000, May 2010 – April 2015.
10. **IBM Contract, Agreement No. F472U, “Removal of Carbonaceous Residue in Greensheet Processing for Multilayer Ceramic Module,” $202,771,** July 15, 1986–November 14, 1989.
11. **IBM** University Agreement No. 02624, “Mass Transfer Rate Enhancement by Pressure Cycling Generated with Acoustic Waves,” $261,939, June 1, 1991–May 31, 1994.

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1. The Camille and Henry Dreyfus Foundation, Teacher–Scholar Grant, $35,000, 1977–82.
2. General Motors Corporation, PO–185283, “Engineering Analysis of Cupola Iron Melting Process,” $3,000, April–June 1978.
3. **Chevron** Research Grant (through the University of Utah), “A Cooperative Research Effort to Investigate Thermally Controlled Oil Shale Retorting Processes” (with H.R. Jacobs and A.L. Tyler), $25,065, October 29, 1981–December 31, 1982.
4. ALCOA Foundation Science Support Grant, $7,500, 1982.
5. E. I. **du Pont** de Nemours & Co., unrestricted grant, “Morphological Changes during the Chlorination of Titaniferous Minerals,” $10,000, January 1989.
6. **Western Zirconium/State of Utah**, “A Study of Fluid–Bed Chlorination of Zirconium Sand” (with A. L. Tyler and D. A. Dahlstrom), $64,268, January 1–December 31, 1989.
7. E. I. **du Pont** de Nemours & Co., unrestricted grant, “Chlorination of Titaniferous Minerals,” $21,000, January 1990.
8. E. I. **du Pont** de Nemours & Co., unrestricted grant, “Chlorination of Titaniferous Minerals,” $22,000, January 1991.
9. E. I. **du Pont** de Nemours & Co., unrestricted grant, “Chlorination of Titaniferous Minerals,” $12,000, February 1992.
10. Nippon Mining and Metals Co., Tokyo, Japan, “Particle Dispersion in a Turbulent Gas Jet,” support for graduate student and equipment, June 26, 1991–June 25, 1993.
11. Outokumpu Oy, Pori, Finland, “FIash Smelting of Nickel Concentrates,” support for research associate, July 7, 1992–September 30, 1994.
12. Outokumpu Oy, Pori, Finland, “Bath Smelting of Nickel Concentrates,” support for research associate, July 7, 1992–September 30, 1994.
13. Outokumpu Oy, Pori, Finland, “Flash Converting of Solid Copper Matte,” support for research associate, August 1, 1994–July 31, 1997.
14. Chrysalis Technologies Inc., “Chemical Vapor Synthesis of Intermetallic Compounds - Supplemental,” $108,500, November, 2001.
15. Kennecott Utah Copper Company, “FCF Boiler Accretion Buildup Investigation,” $25,000, January 18 – December 31, 2002.
16. China Yunnan Metallurgical Group, unrestricted grant, “Polysilicon Production,” $21,750, October 2007 – May 2008.

**C. State Government/University of Utah**

1. University of Utah, Development Fund, current fund ~$900,000, 1977 – no ending date.
2. BP Minerals America/State of Utah, “Center of Excellence for Advanced Pyrometallurgical Technology,” **$1,661,475** including matching funds ($350,480 State funds), July 1, 1988–June 30, 1990.
3. University of Utah, “PCT Equipment Purchase,” (with Z. Fang), **$150,000**, 2007.

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1. University of Utah, Research Committee Grant, “Analytical Investigation of Gas–Solid Reactions,” $2,421, 1974–1977.
2. The State of Utah, Mineral Leasing Fund, “Kinetics of Roasting and Hydrogen Reduction of Sulfide Copper Minerals in the Presence of Lime,” $8,000, 1975–1977.
3. The State of Utah, Mineral Leasing Fund, “Direct Reduction of Iron Ore with Natural or Synthetic Natural Gas,” $8,000, 1976–1977.
4. University of Utah, Institutional Funds, “Thermogravimetric Analysis Equipment,” $14,400, 1976–1977.
5. University of Utah, Research Committee Grant, “Formation of Nickel Carbonyl from Nickel Sulfide,” $3,120, November 1978–August 1980.
6. The State of Utah, Mineral Leasing Fund, “Direct Reduction of Sulfide Copper Minerals by Carbon Monoxide and Reformed Natural Gas,” $8,000, 1979–81.
7. The State of Utah Mineral Leasing Fund, “The Production of High–Purity Copper by the Gaseous Reduction of Copper Sulfate,” $7,500, 1980–82.
8. University of Utah, Research Committee Grant, “The Effect of Reduced Retorting Pressure on the Properties and Yield of Oil from Oil Shale,” $5,000, November 5, 1981–December 31, 1982.
9. The State of Utah, Mineral Leasing Fund, “The Use of Small Additions of Coal to Increase the Oil Recovery from Oil Shale,” $5,250, October 1981–October 1982.
10. The State of Utah, Mineral Leasing Fund, Student Support, $3,000, 1981–1982.
11. University of Utah, Institutional Funds, “Data Acquisition and Processing System,” $18,900, 1982.
12. University of Utah, Research Committee Grant, “An Innovative Approach to Increasing the Rates of Gas–Solid Reactions by Pressure Cycling,” $5,000, December 1982–December 1984.
13. The State of Utah, Mineral Leasing Fund, “Reduced Pressure Retorting of Oil Shale: Its Effect on Yield and Oil Properties,” $10,210, December 1982–September 1983.
14. The State of Utah, Mineral Leasing Fund, “The Ignition of Oil Shale Beds with Hot Air,” $2,000, November 1983–February 1984.
15. The State of Utah, Mineral Leasing Fund, “The Effect of Pressure Pulsation on the Gasification and Combustion of Carbonaceous Materials,” $8,500, November 1983–October 1984.
16. University of Utah Computer Center, Student Research Fund, “Direct Reduction of Iron Oxides under Variable Pressure —M. Aboukheshem,” $5,000, May 1984, $5,000, 1985.
17. University of Utah Computer Center, Student Research Fund, “Mathematical Modeling of Flash Smelting Processes—Y. B. Hahn,” $5,000, June 1984; $5,000, 1985; $5,000, 1986.
18. University of Utah Computer Center, Student Research Fund, “Mathematical Modeling of Hybrid Retorting of Oil Shale with Coal—P. C. Chaubal,” $5,000, July 1984; $5,000, 1985.
19. The State of Utah Mineral Leasing Fund, “Volatilization of Minor Elements during the Flash Smelting of Chalcopyrite,” $7,500, October 1, 1984–September 30, 1985.
20. The State of Utah Mineral Leasing Fund, “Distribution and Transport of Solid Particles in a Particle–Laden Gas Jet,” $7,000, October 1, 1985–September 30, 1986.
21. The State of Utah Mineral Leasing Fund, “Combustion of Pulverized Coal Mixed with Pulverized Oil Shale,” $3,000, October 1, 1986–September 30, 1987.
22. University of Utah, Research Committee Grant, “Combustion Synthesis of Intermetallic Compounds,” $5,000, May 11, 1987–December 31, 1990.
23. The State of Utah Mineral Leasing Fund, “Self–Propagating High–Temperature Synthesis of Ceramic Materials,” $14,000, October 1, 1987–September 30, 1988.
24. The State of Utah Mineral Leasing Fund, “Synthetic Rutile from Low–Grade Ilmenite Ore by the Carbothermal Reduction and Separation of Iron,” $7,500, October 1, 1988–September 30, 1989.
25. Western Zirconium/State of Utah, “A Study of Fluid–Bed Chlorination of Zirconium Sand” (with A. L. Tyler and D. A. Dahlstrom), $64,268, January 1–December 31, 1989.
26. National Cold Fusion Institute, “Alternative Materials for Cathode in an Electrochemical Cell for Cold Fusion,” $26,238, January 1–December 31, 1990.
27. The State of Utah Mineral Leasing Fund, “Physical Modeling of Bottom Oxygen Injection in Copper Smelting,” $9,654, November 20, 1989–June 30, 1990.
28. The State of Utah Mineral Leasing Fund, “Flow Characteristics in a Gas–Stirred Channel Reactor,” $13,500, July 1, 1990–June 30, 1991.
29. University of Utah, Research Committee Grant, “A Novel Process for Producing Selected Intermetallic Compounds,” $5,000, June 20, 1991–June 30, 1993.
30. The State of Utah Mineral Leasing Fund, “Synthesis of Intermetallic Compounds from Molten Chlorides,” $7,092, July 1, 1991–June 30, 1992.
31. The State of Utah Mineral Leasing Fund, “Novel Continuous Solvent Extraction Equipment for Metal Extraction and Treatment of Liquid Wastes from Mineral Industry,” $8,780, July 1, 1992–June 30, 1993.
32. The State of Utah Mineral Leasing Fund, “Evaluation of Calcined Calcium Magnesium Acetate (CMA) as an Absorbent for SO2 Gas,” $7,802, July 1, 1993–June 30, 1994.
33. The State of Utah Mineral Leasing Fund, “Flash Smelting of Sulfide Concentrates,” $2,200, July 1, 1993–June 30, 1994.
34. University of Utah Research Committee Grant, “A Novel Solvent Extraction Process Suitable for Treating Hazardous Liquid Wastes,” $5,000, June 1, 1993–June 30, 1995.
35. The State of Utah Mineral Leasing Fund, “The Ignition and Combustion Characteristics of Cu–Fe–S Particles under Flash–Converting Conditions,” $8,366, July 1, 1994–June 30, 1995.
36. The State of Utah Mineral Leasing Fund, “Utilization of Copper Cementation Waste Solution for the Production of Magnetic Recording Particulate Media,” $8,087, July 1, 1995–June 30, 1996.
37. The State of Utah Mineral Leasing Fund, “Conversion of Sulfur Dioxide to Elemental Sulfur,” $5,035, July 1, 1996–June 30, 1997.
38. University of Utah Research Committee Grant, “Solid–Waste–Free Reaction Cycle for Converting Sulfur Dioxide to Elemental Sulfur,” $6,000, December 1, 1997–November 30, 1999.
39. University of Utah Funding Incentive Seed Grant Committee, “Chemical Vapor Synthesis of Nano-Sized Composite Powders for Hydrogen Storage,” $28,000, Nov. 1, 2003–Oct. 31, 2005.
40. University of Utah Research Incentive Seed Grant, “A Green Process for Recycling Lithium-Ion Batteries,” (Co-PI with Y. R. Smith) $27,500, March 1, 2021-Feb. 28, 2022.

**D. Foreign Governments & Sources**

1. Korea Institute of Geoscience and Mineral Resources (KIGAM), “Scale-Up Process Simulation of Silica Nanopowder Production from Waste Silicon Sludge,” **$200,000,** May 1, 2006 – April 31, 2010.
2. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Fundamental Study for the Development of a New Ferro-Manganese Making Process Using Low-Grade Manganese Ores,” **$172,932**, June 1, 2009 – May 31, 2012.

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1. The United Nations Industrial Development Organization (UNIDO), Fellow Research Support through the Carl Duisberg Society, Inc., $9,000, February 22, 1984–February 23, 1985.
2. People's Committee for Students of the Socialist People's Libyan Arab Jamahiriya, Student Support, “Iron Oxide Reduction,” $10,000, July 2, 1985–June 30, 1989.
3. Japan Society for the Promotion of Science Fellowship Grant, Japanese Government, 1990.
4. Aero Technical Research Institute, “Failure Analysis of Aircraft Structural Materials,” $4,500, November 2001 – March 2002.
5. Korea Institute of Geoscience and Mineral Resources (KIGAM), “Mathematical Modeling of Flame Reaction Process for the Synthesis of Silicon Compounds from Waste Silicon Sludge,” $90,277, June 3, 2004 – June 2, 2006.
6. Pai Chai University, Korea, “Plasma-Assisted Chemical Vapor Synthesis of Advanced Ceramic Nanopowders,” $33,000, August 2008 – August 2010.
7. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Study on the Selective Reduction of Fe-Mn Oxide Materials,” $50,000, November 2008 – August 2009.
8. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Advanced research on the purification of molybdenum,” $50,000, November 2008 – October 2009.
9. Pohang Steel Company (POSCO), Pohang, Korea, “Operational Optimization in the Fluidized-Bed Reduction of Magnetite Ore,” $60,000, Feb. 1 – Nov. 15, 2009.
10. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Removal of Phosphorus by the Formation of High Volatile Compounds in the Smelting of Mn Ores,” $70,000, Dec. 1, 2009 – Sept. 30, 2010.
11. Pohang Steel Company (POSCO), Pohang, Korea, “Characterization of magnetite ore for better use in the FINEX process,” $85,000, Feb. 1 – Nov. 30, 2010.
12. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Thermodynamic Investigation on the Refining of Mg Crown,” $70,000, Feb. 1 – Nov. 30, 2010.
13. Pohang Steel Company (POSCO), Pohang, Korea, “Study on the sulfur and nitrogen control under mass scrap melting in converter,” $62,000, May 1, 2010 – February 28, 2011.
14. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Evaluation of the Process for the Vanadium Recovery from Black Shale,” $82,608, Feb. 1 – Nov. 30, 2011.
15. Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, “Development of Technologies for the Effective Separation between Distillation and Melting Processes of Mg Crown,” $87,000, Feb. 1 – Nov. 30, 2011.

**LIST OF PUBLICATIONS**

by

**H. Y. SOHN**

**Books**

1. H. Y. Sohn, *Flash Ironmaking*, Taylor & Francis, NY, 270 pp., 2023.
2. H. Y. Sohn, *Fluid–Solid Reactions*, Elsevier, Cambridge, MA 02139, 536 pp., 2020. <https://www.elsevier.com/books/fluid-solid-reactions/sohn/978-0-12-816466-2>
3. J. Szekely, J. W. Evans, and H. Y. Sohn, *Gas–Solid Reactions*, Academic Press, New York, 400 pp., 1976; translated in Chinese, D. Hu, translator, Chinese Building Industry Publishing House, Beijing, China, 1986.
4. H. Y. Sohn and M. E. Wadsworth, *Rate Processes of Extractive Metallurgy*, Plenum, New York, 472 pp., 1979; translated in Chinese, Ti Ou Ye Jin Su Lu Guo Cheng, Yejin Gongye Publ. House, Beijing, China, 1984; translated in Spanish, Cinetica de los Procesos de la Metalurgia Extractiva, Editorial Trillas, Mexico City, Mexico, 1986.
5. H. Y. Sohn, *Chemical Vapor Synthesis of Inorganic Nanopowders*, Nova Science Publishers, Hauppauge, NY 11788, 2011.
6. S. Seetharaman, A. McLean, R. Guthrie, S. Sridhar, and H. Y. Sohn, Co-Editors-in-Chief, *Treatise on Process Metallurgy,* *2nd ed*., Elsevier, Oxford, UK and Waltham, MA, USA.
7. H. Y. Sohn, *Volume 3 Chapter 2. Non-Ferrous Process Principles and Production Technologies*, Monograph within a super treatise titled *Treatise on Process Metallurgy, 2nd ed*., S. Seetharaman et al. eds., Elsevier, Oxford, UK and Waltham, MA, USA.
8. H. Y. Sohn, *Volume 4 Chapter 2. Modelling of Industrial Processes*,Monograph within a super treatise titled *Treatise on Process Metallurgy*, *2nd ed*., S. Seetharaman et al. eds., Elsevier, Oxford, UK and Waltham, MA, USA.
9. H. Y. Sohn, *Chapter 2 Non-Ferrous Process Principles and Production Technologies*,*Volume 3 Industrial Processes Part A,* pp. 533-1097,Monograph within a super treatise titled *Treatise on Process Metallurgy*, *1st ed*., S. Seetharaman et al. eds., Elsevier, Oxford, UK and Waltham, MA, USA, 2014.
10. H. Y. Sohn, O. N. Carlson, and J. T. Smith, *Extractive Metallurgy of Refractory Metals,* edited book, Proceedings of a symposium at the 110th AIME Annual Meeting, Chicago, Illinois, February 22–26, 1981, TMS–AIME, Warrendale, Pennsylvania, 475 pp., 1980.
11. H. Y. Sohn, S. D. Hill, J. M. Wie, and K. V. S. Sastry, eds., *Processing of Energy and Metallic Minerals*, AIChE Symposium Series, Vol. 78, No. 216, American Institute of Chemical Engineers (New York), 150 pp., 1982.
12. H. Y. Sohn, D. B. George, and A. D. Zunkel, *Advances in Sulfide Smelting: Vol. 1 Basic Principles*, edited book, Proceedings of the 1983 International Sulfide Smelting Symposium and the 1983 Fall Extractive and Process Metallurgy Meeting of TMS–AIME, held in San Francisco, California, November 6–9, 1983, TMS–AIME, Warrendale, Pennsylvania, 1983.
13. H. Y. Sohn, D. B. George, and A. D. Zunkel, *Advances in Sulfide Smelting: Vol. 2 Technology and Practice*, edited book, Proceedings of the 1983 International Sulfide Smelting Symposium and the 1983 Fall Extractive and Process Metallurgy Meeting of TMS–AIME, held in San Francisco, California, November 6–9, 1983, TMS–AIME, Warrendale, Pennsylvania, 1983.
14. P. R. Taylor, H. Y. Sohn, and N. Jarrett, *Recycle and Secondary Recovery of Metals*, edited book, Proceedings of the 1985 International Symposium on Recycle and Secondary Recovery of Metals and the 1985 Fall Extractive and Process Metallurgy Meeting of TMS–AIME, held in Fort Lauderdale, Florida, December 1–4, 1985, TMS–AIME, Warrendale, Pennsylvania, 1985.
15. D. G. C. Robertson and H. Y. Sohn, *Gas–Solid Reactions in Pyrometallurgy*, edited book, Proceedings of the 1986 Center for Pyrometallurgy Conference, West Lafayette, Indiana, April 24–25, 1986, published by The Center for Pyrometallurgy, University of Missouri–Rolla, Rolla, Missouri, 1986.
16. D. G. C. Robertson, H. Y. Sohn, and N. J. Themelis, *Flash Reaction Processes,* edited book, Proceedings of the 1988 Center for Pyrometallurgy Conference, Salt Lake City, Utah, June 15–17, 1988, published by The Center for Pyrometallurgy, University of Missouri–Rolla, Rolla, Missouri, 1988.
17. H. Y. Sohn and E. S. Geskin, *Metallurgical Processes for the Year 2000 and Beyond,* edited book, Proceedings of the 1989 International Symposium on Metallurgical Processes for the Year 2000 and Beyond, in conjunction with the 118th TMS Annual Meeting, Las Vegas, Nevada, February 27–March 2, 1989, TMS–AIME, Warrendale, Pennsylvania, 1988.
18. H. Y. Sohn, *Metallurgical Processes for the Early Twenty–First Century: Vol. I. Basic Principles,* edited book, Proceedings of the Second International Symposium on Metallurgical

Processes for the Year 2000 and Beyond and the 1994 TMS Fall Extraction and Process Metallurgy Meeting, San Diego, California, September 20–23, 1994, TMS–AIME, Warrendale, Pennsylvania, 1994.

1. H. Y. Sohn, *Metallurgical Processes for the Early Twenty–First Century: Vol. II. Technology and Practice*, edited book, Proceedings of the Second International Symposium on Metallurgical Processes for the Year 2000 and Beyond and the 1994 TMS Fall Extraction and Process Metallurgy Meeting, San Diego, California, September 20–23, 1994, TMS–AIME, Warrendale, Pennsylvania, 1994.
2. H. Y. Sohn, J. W. Evans, and D. Apelian, *Proceedings of the Julian Szekely Memorial Symposium on Materials Processing*, edited book, Proceedings of the title symposium and the 1997 TMS Fall Extraction and Processing Conference, Cambridge, Massachusetts, October 5–8, 1997, TMS, Warrendale, Pennsylvania, 1997.
3. W. D. Cho and H. Y. Sohn, *Value–Addition Metallurgy*, edited book, Proceedings of the International Symposium on Value–Addition Metallurgy, in conjunction with the 127th TMS Annual Meeting, San Antonio, Texas, February 15–19, 1998, TMS, Warrendale, Pennsylvania, 1998.
4. R. L. Stephens and H. Y. Sohn, *Sulfide Smelting 2002*, edited book, Proceedings of the Third International Sulfide Smelting Symposium: “Sulfide Smelting ‘02”, in conjunction with the 131st TMS Annual Meeting, Seattle, Washington, February 17–21, 2002, TMS, Warrendale, Pennsylvania, 2002.
5. F. Kongoli, K. Itagaki, C. Yamauchi, and H. Y. Sohn, *Metallurgical and Materials Processing: Principles and Technologies*, *Vol. 1*: *Materials Processing Fundamentals and New Technologies*, edited book, Proceedings of the Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, in conjunction with the 132nd TMS Annual Meeting, San Diego, California, March 2–6, 2003, TMS, Warrendale, Pennsylvania, 2003.
6. F. Kongoli, K. Itagaki, C. Yamauchi, and H. Y. Sohn, *Metallurgical and Materials Processing: Principles and Technologies, Vol. 2: High-Temperature Metal Production*, edited book, Proceedings of the Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, in conjunction with the 132nd TMS Annual Meeting, San Diego, California, March 2–6, 2003, TMS, Warrendale, Pennsylvania, 2003.
7. F. Kongoli, K. Itagaki, C. Yamauchi, and H. Y. Sohn, *Metallurgical and Materials Processing: Principles and Technologies, Vol. 3: Aqueous and Electrochemical Processing*, edited book, Proceedings of the Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, in conjunction with the 132nd TMS Annual Meeting, San Diego, California, March 2–6, 2003, TMS, Warrendale, Pennsylvania, 2003.
8. T. Jiang, J.-Y. Hwang, G. Alvear, O. Yucel, X. Mao, H. Y. Sohn, N. Ma, P. J. Mackey, and T. P. Battle, *High-Temperature Metallurgical Processing*, Proceedings of the 6th International Symposium, in conjunction with the 144th TMS Annual Meeting, Orlando, Florida, March 15-19, TMS, Warrendale, Pennsylvania, 2015.

**Book Chapters**

1. H. Y. Sohn, “Fundamentals of Kinetics of Heterogeneous Reaction Systems in Extractive Metallurgy,” Chapter 1, *Rate Processes of Extractive Metallurgy,* ed. by H. Y. Sohn and M. E. Wadsworth (Proceedings of a short course held at the University of Utah, December 18–20, 1975), Plenum, pp. 1–51, 1979.
2. H. Y. Sohn and E. T. Turkdogan, “Calcination,” Sec. 4.3, *Rate Processes of Extractive Metallurgy,* ed. by H. Y. Sohn and M. E. Wadsworth (Proceedings of a short course held at the University of Utah, December 18–20, 1975), Plenum, pp. 321–29, 1979.
3. H. Y. Sohn, “Gas–Solid Reactions in Extractive Metallurgy,” in *Metallurgical Treatises,* edited by J. K. Tien and J. F. Elliott, TMS–AIME, pp. 23–39, 1981.
4. W. J. Schlitt and H. Y. Sohn, “Hydrometallurgy,” in *Encyclopedia of Materials Science and Engineering,* ed. by M. B. Bever, Vol. 3 F–I, pp. 2245–50, Pergamon Press/MIT Press, 1986.
5. H. Y. Sohn and P. C. Chaubal, “Heat and Mass Transfer in Fluid–Solid Reactions and Reactors,” in *Advances in Transport Processes in Metallurgical Systems,* Chapter 1, ed. by Y. Sahai and G. R. St. Pierre, Elsevier, Amsterdam, The Netherlands, pp. 1–52, 1992.
6. H. Y. Sohn, “Nonferrous Metals: Production and History,” in *Encyclopedia of Materials: Science and* *Technology,* Elsevier Science, pp. 6191-6197, 2001.
7. H. Y. Sohn, “Hydrometallurgical Principles,” in *Encyclopedia of Materials: Science and* *Technology,* Elsevier Science, pp. 3976-3982, 2001.
8. H. Y. Sohn and S. Sridhar, “Descriptions of High-Temperature Metallurgical Processes,” Chapter 1, *Fundamentals of Metallurgy*, ed. by S. Seetharaman, Woodhead Publishing, Cambridge, UK, pp. 3-37, 2005.
9. S. Sridhar and H. Y. Sohn, “The Kinetics of Metallurgical Reactions,” Chapter 7, *Fundamentals of Metallurgy*, ed. by S. Seetharaman, Woodhead Publishing, Cambridge, UK, pp. 270-349, 2005.
10. H. Y. Sohn and T. Ryu, “Chemical Vapor Synthesis (CVS) of Inorganic Nanopowders,” Chapter 5, [*Nanopowders and Nanocoatings: Production, Properties and Applications*](https://www.novapublishers.com/catalog/product_info.php?products_id=10391), ed. by V. F. Cotler, Nova Science Publishers, Hauppauge, NY 11788, pp. 147-178, 2010. <https://www.novapublishers.com/catalog/product_info.php?products_id=10391>
11. H. Y. Sohn, M. Olivas-Martinez and S. E. Perez-Fontes, “Mathematical Modeling of Nanopowder Production by Vapor-Phase Processes,” Chapter 3, *Mathematical Modelling*, ed. by C. R. Brennan, Nova Science Publishers, Hauppauge, NY 11788, pp.179-208, 2013; ebook, 2011.
12. H. Y. Sohn and M. E. Choi, “Steel Industry and Carbon Dioxide Emissions - A Novel Ironmaking Process with Greatly Reduced Carbon Footprint,” *Carbon Dioxide Emissions: New Research*, ed. by M. Carpenter and E. J. Shelton, Nova Science Publishers, Inc., Hauppauge, NY 11788, 2012. [*https://www.novapublishers.com/catalog/product\_info.php?products\_id=30398*](https://www.novapublishers.com/catalog/product_info.php?products_id=30398)
13. H. Y. Sohn, “Principles of Copper Production,” *Treatise on Process Metallurgy*, *Volume 3 Industrial Processes Part A, Section 2.1.1,* pp. 534-591,Elsevier, Oxford, UK and Waltham, MA, USA, 2014.
14. H. Y. Sohn, “Industrial Technologies for Copper Production,” *Treatise on Process Metallurgy*, *Volume 3 Industrial Processes Part A, Section 2.1.2,* pp. 591-600, Elsevier, Oxford, UK and Waltham, MA, USA, 2014.
15. H. Y. Sohn and M. Olivas-Martinez, “Lead Production,” *Treatise on Process Metallurgy*, *Volume 3 Industrial Processes Part A, Section 2.3.1,* pp. 671-693,Elsevier, Oxford, UK and Waltham, MA, USA, 2014.
16. H. Y. Sohn and M. Olivas-Martinez, “Zinc Production,” Chapter 2.3.2 *Treatise on Process Metallurgy*, *Volume 3 Industrial Processes Part A, Section 2.3.2,* pp. 693-700, Elsevier, Oxford, UK and Waltham, MA, USA, 2014.
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40. “\_\_,” Hangzhou Institute of Mining and Metallurgy, Hangzhou, China, September 24, 1982.
41. “The Extraction of Alumina from Coal Wastes,” Alcoa Tech. Center, Alcoa Center, Pennsylvania, December 3, 1982.
42. “Analysis and Modeling of Gaseous Reduction Processes,” International Conference on the Metallurgy of Nickel, Bucaramanaga, Colombia, February 7–11, 1983.
43. “Physical Chemistry of the System Ni–S–O,” International Conference on the Metallurgy of Nickel, Bucaramanga, Colombia, February 7–11, 1983.
44. “Physical Chemistry of the Reduction of Nickel Oxide,” International Conference on the Metallurgy of Nickel, Bucaramanga, Colombia, February 7–11, 1983.
45. AMAX Lecture, “An Experimental and Modeling Study of the Hydrogen Reduction of Copper Sulfide in the Presence of Lime,” Department of Chemical and Metallurgical Engineering, University of Nevada–Reno, Reno, Nevada, April 11, 1983.
46. “Models for Iron–Oxide Reduction and Rate Enhancement by Pressure Cycling,” Japan–U.S. Seminar on the Advances in the Science of Iron– and Steelmaking, Kyoto, Japan, May 16–20, 1983.
47. “Kinetics of Fluid–Solid Reactions in Extractive Metallurgy,” The Second National Symposium of Metallurgical Engineering, Lima, Peru, November 14–19, 1983.
48. “The Status of Metallurgy Education in the U.S. and Some Recommendations for Peru,” The Second National Symposium of Metallurgical Engineering, Lima, Peru, November 14–19, 1983.
49. “Modeling of the Gas–Solid Reactions in Extractive Metallurgy,” National San Antonio University of Cuzco, Cuzco, Peru, November 22, 1983.
50. “Metallurgical Engineering Program and Pyrometallurgy Research at the University of Utah,” National San Augustine University of Arequipa, Arequipa, Peru, November 23, 1983.
51. “Novel Processes for Treating Sulfide Minerals,” National San Augustine University of Arequipa, Arequipa, Peru, November 24, 1983.
52. Plenary Lecturer, “Phase Changes during Gas–Solid Reactions Involving Minerals,” Second International Congress on Applied Mineralogy in the Mineral Industry, Los Angeles, California, February 22–25, 1984.
53. “The Hydrogen Reduction of Metal Sulfides in the Presence of Lime,” Department of Metallurgical Engineering, Michigan Technological University, Houghton, Michigan, April 25, 1984.
54. “Hydrogen Reduction of Metal Sulfides in the Presence of Lime,” Department of Chemical Engineering, University of Arizona, Tucson, Arizona, April 2, 1985.
55. “Gas–Solid Reaction Analysis: Gasification of Carbonaceous Residue,” IBM East Fishkill Facility, Hopewell Junction, New York, April 8, 1985.
56. “Alumina from Coal Wastes through the Formation of Aluminum Nitride,” Korea Institute of Energy and Resources, Daejeon, Korea, December 11, 1985.
57. “Fluid Dynamics of Turbulent Particle–Laden Gas Jets in Flash Reaction Systems,” Department of Chemical Engineering, Seoul National University, Seoul, Korea, September 11, 1986.
58. “\_\_,” Korea Advanced Institute of Science and Technology, Seoul, Korea, September 12, 1986.
59. “Mathematical Modeling of the Flash–Smelting Process,” Korea Mining and Smelting Co., Ltd., Seoul, Korea, September 15, 1986.
60. “Pulverized Coal Combustion Process,” Korea Electric Power Corp., Daejeon, Korea, September 16, 1986.
61. “Fluid Dynamics of Turbulent Particle–Laden Gas Jets in Flash Reaction Systems,” Department of Chemical Engineering, Ajou University, Suwon, Korea, September 17, 1986.
62. “\_\_,” Kawasaki Steel Corp., Research Laboratories, Chiba, Japan, September 22, 1986.
63. “The Behavior of Particle–Laden Gas Jets as Related to the Flash–Smelting Process,” Nippon Mining Co., Ltd., Saganoseki Smelter, Oita, Kyushu, Japan, September 25, 1986.
64. “Fluid Dynamics of Turbulent Particle–Laden Gas Jets in Flash Reaction Systems,” Department of Metallurgy, Kyoto University, Kyoto, Japan, September 26, 1986.
65. “Mathematical Modeling of Turbulent Flash Reaction Systems,” Department of Chemical Engineering, University of Utah, May 19, 1987.
66. “Chemical Reactions between Fine Solid Particles: Application to the Combustion Synthesis of Ceramic Materials,” Oriental Chemicals Industry Co., Inchon, Korea, September 19, 1987.
67. “\_\_,” Korea Institute of Energy and Resources, Daejeon, Korea, September 26, 1987.
68. “\_\_,” Department of Iron and Steel Engineering, Nagoya University, Nagoya, Japan, October 2, 1987.
69. Intensive graduate course, “Fluid–Solid Reaction Engineering,” Department of Chemical Engineering, Chunnam National University, Kwangju, Korea, 1987.
70. Intensive course, “Direct Reduction of Iron Ore: Process Principles and Practice,” Universidad Central de Venezuela, Caracas, Venezuela, March 14–25, 1988,
71. “Flash Smelting of Copper Concentrate,” Department of Metallurgy, Kunming Institute of Technology, Kunming, Yunnan, China, March 30, 1989.
72. “The Current State of Extractive Metallurgy in the U.S.,” Department of Metallurgy, Kunming Institute of Technology, Kunming, Yunnan, China, March 30, 1989.
73. “Selective Oxidation of Mixed Sulfide Ores without Pollution,” Department of Metallurgy, Kunming Institute of Technology, Kunming, Yunnan, China, March 31, 1989.
74. “Hydrogen Reduction of Metal Sulfides in the Presence of Lime,” Department of Metallurgy, Kunming Institute of Technology, Kunming, Yunnan, China, March 31, 1989.
75. “Flash Smelting of Sulfide Minerals,” Department of Chemical Engineering, Chengdu University of Science and Technology, Chengdu, Sichuan, China, April 5, 1989.
76. “Extractive Metallurgy Programs at American universities,” Department of Chemical Engineering, Chengdu University of Science and Technology, Chengdu, Sichuan, China, April 5, 1989.
77. “Importance of Transport Phenomena in Metallurgical Processes,” Department of Metallurgical Engineering, Central–South University of Technology, Changsha, Hunan, China, April 19, 1989.
78. “Experimental and Mathematical Modeling Investigation of Flash Smelting Processes,” Department of Metallurgical Engineering, Central–South University of Technology, Changsha, Hunan, China, April 20, 1989.
79. “Selective Oxidation of Mixed Sulfide Ores without Pollution,” Department of Metallurgical Engineering, Central–South University of Technology, Changsha, Hunan, China, April 21, 1989.
80. “Analysis of Carbothermal Reduction Processes,” Department of Metallurgical Engineering, Central–South University of Technology, Changsha, Hunan, China, April 21, 1989.
81. “Selective Chlorination of Iron from Low–Grade Titanium Minerals,” Department of Metallurgical Engineering, Central–South University of Technology, Changsha, Hunan, China, April 22, 1989.
82. “Experimental and Mathematical Modeling Investigation of Flash Smelting Processes,” Beijing General Research Institute of Mining and Metallurgy, Beijing, China, April 24, 1989.
83. “The Current State of Chemical Metallurgy in the U.S. and Metallurgical Engineering Program at the University of Utah,” Beijing University of Iron and Steel Technology, Beijing, China, April 25, 1989.
84. “Problems and Promises of Metallurgical Industry in the U.S.,” Shanghai Metallurgical Society, Shanghai, China, April 1989.
85. “Chlorination of Low Grade Titanium Minerals in a Fluidized Bed,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 9, 1989.
86. “Selective Oxidation of Mixed Sulfide Ores without Pollution,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 10, 1989.
87. “Experimental and Mathematical Modelling of Flash Smelting Processes,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 11, 1989.
88. “Analysis of Carbothermal Reduction Processes,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 12, 1989.
89. “Undergraduate and Graduate Teaching and Research Programmes at the University of Utah,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 15, 1989.
90. “Major Problems in Extractive Metallurgy,” CSIRO Division of Mineral and Process Engineering and Monash University Department of Chemical Engineering, Melbourne, Victoria, Australia, May 16, 1989.
91. “Gas–Solid Reactions in Metallurgical Processes'” Department of Chemical and Materials Engineering, University of Auckland, Auckland, New Zealand, May 18, 1989.
92. TMS Extractive Metallurgy Lecture, “The Coming–of–Age of Process Engineering in Extractive Metallurgy,” 119th TMS Annual Meeting, Anaheim, California, February 18–22, 1990.
93. “Self–Propagating High–Temperature Synthesis,” Korea Institute of Science and Technology, Seoul, Korea, March 12, 1990.
94. “Reactions of Mineral Particles and Related Process Modeling,” Department of Metallurgy and Mining Engineering, University of Idaho, Moscow, Idaho, April 9, 1990.
95. “The Removal of Carbonaceous Residue in Greensheet Processing for Multilayer Ceramic Module,” IBM, East Fishkill, New York, April 16, 1990.
96. “The Present and Future of Process Engineering in Metallurgy,” Kawasaki Steel Corp., Research Laboratories, Chiba, Japan, October 4, 1990.
97. “\_\_,” Nippon Steel Corporation, Central R&D Bureau, Kawasaki, Japan, October 5, 1990.
98. “The Present and Future of Process Engineering in Metallurgical Industry and Education,” Department of Metallurgy, Kyoto University, Kyoto, Japan, October 6, 1990.
99. “\_\_,” Departments of Materials Processing Engineering and of Materials Science and Engineering, Nagoya University, Nagoya, Japan, October 15, 1990.
100. “Experimental and Mathematical Investigation of Copper Flash Smelting,” Nippon Mining Co., Ltd., Saganoseki Smelter, Oita, Kyushu, Japan, October 19, 1990.
101. “Minor Element Behavior and Process Engineering in Copper Smelting,” Mitsubishi Materials Corporation, Naoshima Smelter, Kagawa, Japan, October 22, 1990.
102. “Experimental and Mathematical Investigation of Copper Flash Smelting,” Sumitomo Metal Mining Co., Ltd., Toyo Smelter and Refinery, Ehime, Japan, October 23, 1990.
103. Keynote Lecturer, “Production of Ultrapure Tungsten,” Rare Metals '90, International Symposium on Processing of Rare Metals, Kokura, Kitakyushu, Japan, November 14–16, 1990.
104. “The Greensheet Process in the Production of Multilayer Ceramic Modules for Microelectronic Packaging,” Oriental Chemicals Industry Co., Inchon, Korea, November 19, 1990.
105. “The Present and Future of Process Engineering in Materials Processing,” Department of Chemical Engineering, Hanyang University, Seoul, Korea, November 19, 1990.
106. “The Kinetics and Mechanism of TiAl3 Formation by Self–Propagating High–Temperature Synthesis,” Korea Institute of Science and Technology, Seoul, Korea, November 21, 1990.
107. “The Greensheet Processing in the Production of Multilayer Ceramic Modules for Microelectronic Packaging,” Lucky Metals Corp., Research Center, Yongin–Gun, Kyunggi–do, Korea, November 22, 1990.
108. “The Coming–of–Age of Metallurgical Process Engineering in Industry and Education,” Department of Metallurgy and Materials Engineering, University of Alabama, Tuscaloosa, Alabama, February 15, 1991.
109. “Treatment of Solid Wastes from Titanium, Zirconium, and Tungsten Production,” ICF–EPA Workshop, Washington, DC, December 5, 1991.
110. Plenary Lecturer, “Importance of Process Engineering in Extractive Metallurgy,” The Fourth National Congress of Nonferrous Extractive Metallurgy, Guaymas, Sonora, Mexico, May 27–29, 1992.
111. Plenary Lecture “Quantitative Description of the Flash Smelting Process,” The Fourth National Congress of Nonferrous Extractive Metallurgy, Guaymas, Sonora, Mexico, May 27–29, 1992.
112. “The Importance of Process Engineering in Metallurgical Industry,” Kunming Institute Technology, Kunming, Yunnan, China, June 15, 1992.
113. “The Combustion Synthesis of Intermetallic Compounds,” Department of Metallurgy, Kunming Institute of Technology, Kunming, Yunnan, China, June 15, 1992.
114. “The Self–Propagating High–Temperature Synthesis of Nickel and Titanium Aluminides,” R&D Laboratory, Gold Star Cable Co., Ltd., Anyang, Kyunggi–do, Korea, July 1, 1992.
115. “Recent Developments in Iron Oxide Reduction and Smelting Reduction Process,” Research Institute of Industrial Science and Technology, Pohang Steel Co., Pohang, Korea, July 8, 1992.
116. “The Self–Propagating High–Temperature Synthesis of Intermetallic Compounds,” Korea Institute of Machinery and Metals, Changwon, Kyungnam, Korea, July 10, 1992.
117. “Extractive Metallurgy of Rare Earth Metals and Their Applications,” R&D Center, Taihan Sugar Industrial Co., Ltd., Inchon, Korea, July 11, 1992.
118. “The Ignition and Combustion of Sulfide Mineral Particles under Flash–Smelting Conditions,” Paul E. Queneau International Symposium, 122nd TMS, Annual Meeting, Denver, Colorado, February 21–25, 1993.
119. “Theoretical Basis of the Rate Analysis of Complex Fluid–Solid Reactions,” Korea Institute of Geology, Mining and Materials, Daejeon, Korea, November 2, 1993.
120. “Application of the Theory of Reactions between Solids Proceeding through Gaseous Intermediates to the Oxidation of Molybdenum Sulfide without Pollution,” Korea Institute of Geology, Mining and Materials, Daejeon, Korea, November 3, 1993.
121. Plenary Lecture, “Mathematical Modeling of Flash Combustion Processes,” NATO Advanced Research Workshop on Flash Reaction Processes, Istanbul, Turkey, May 6–9, 1994.
122. Plenary Lecture, “Understanding the Flash Smelting Process Better,” The 8th National Congress of Metallurgy and the 3rd Congress of Latin American Association of Metallurgy and Materials, Antofagasta, Chile, August 8–12, 1994.
123. “\_\_,” Chuquicamata Division, CODELCO, Chile, August 12, 1994.
124. “Computer Simulation of Copper Flash Smelting Process,” Department of Metallurgy, Universidad de Concepcion, Chile, August 16, 1994.
125. “Understanding Flash and Bath Smelting Phenomena,” Centro de Investigacion Minera y Metalurgica (CIMM), Santiago, Chile, August 18, 1994.
126. “Fluid–Solid Reaction Analysis,” Short Course, Department of Metallurgy, Universidad de Concepcion, Chile, November 1995.
127. Keynote Lecturer, “Recent Developments and Future Trends in Copper Smelting,” FOMINOR '95, Antofagasta, Chile, November 30, 1995.
128. “Outokumpu Flash Smelting and Flash Converting and Improved Environmental Control,” Department of Metallurgical Engineering, Universidad Catolica del Norte, Antofagasta, Chile, December 1, 1995.
129. Keynote Lecturer, “Mathematical Modeling of the Flash Converting Process,” The 3rd Colloquium on Process Simulation, Helsinki University of Technology, Espoo, Finland, June 14, 1996.
130. Graduate Course, “Heterogeneous Kinetics”, Royal Institute of Technology, Stockholm, Sweden, June - July 1996.
131. “Flow and Emulsion Characteristics in QSL–Type Channel Reactors,” Korea Zinc Co., Onsan, Korea, August 28, 1996.
132. “Business and Technology Trends in Copper Industry,” LG Metals, Onsan, Korea, August 29, 1996.
133. “Drop Size Distribution and Interfacial Area in a Slag–Metal Emulsion Generated by Bottom Gas Injection,” Research Institute of Industrial Science and Technology (RIST), Pohang, Korea, August 30, 1996.
134. “Process Engineering and Advanced Materials,” Graduate School of Iron and Steel Technology, Pohang University of Science and Technology (POSTECH), Pohang, Korea, September 3, 1996.
135. “Combustion Synthesis of Titanium– and Nickel–Aluminide Intermetallic Compounds,” Research Institute of Advanced Materials, Chonbuk National University, Chonju, Korea, September 4, 1996.
136. “The Role of Chemical Engineers in Materials Processing in the 21st Century,” Department of Chemical Engineering, Cheju National University, Cheju, Korea, September 6, 1996.
137. “Process Engineering and Advanced Materials,” Graduate School and Industry–University Cooperative Research Institute, Ajou University, Suwon, Korea, September 13, 1996.
138. “All about the University of Utah,” Graduate School and Industry–University Cooperative Research Institute, Ajou University, Suwon, Korea, September 13, 1996.
139. “The Importance of Process Engineering in Advanced Materials Processing,” Korea Institute of Science and Technology (KIST), Seoul, Korea, September 18, 1996.
140. “Developments in Gas–Solid Reaction Analysis,” The Julian Szekely Memorial Symposium on Materials Processing, 1997 TMS Fall Extraction and Processing Conference, Cambridge, Massachusetts, October 5–8, 1997.
141. Plenary Lecture, “Advances in Sulfide Smelting — Technology, R&D, and Education,” International Symposium on Sulfide Smelting '98: Current and Future Practices, 127th TMS Annual Meeting, San Antonio, Texas, February 15–19, 1998.
142. “Modern Copper Smelting/Converting Processes: Part I. Technical and Environmental Factors,” Anhui Polytechnic University, Maanshan, Anhui, China, October 26, 1998.
143. “ — Part II. Minor-Element Behavior and Processing”
144. “ — Part III. Computer Simulations”
145. “College Education in the U.S.A.,” Anhui Polytechnic University, Maanshan, Anhui, China, October 27, 1998.
146. “Combustion Synthesis of Ceramic and Intermetallic Compounds,” Anhui Polytechnic University, Maanshan, Anhui, China, October 28, 1998.
147. Keynote Lecturer, “A New Continuous Solvent Extraction Process with Bottom Gas Injection without Mechanical Agitation,” Third International Conference on Hydrometallurgy, Kunming, China, November 3–5, 1998.
148. “Synthesis of Intermetallic Compound Powders by Vapor–Phase Reduction of Metal Chlorides,” Department of Materials Science and Engineering, University of Utah, February 24, 1999.
149. “Solvent Extraction with Bottom Gas Injection without Moving Parts,” Centro Atomico Bariloche, San Carlos de Bariloche, Rio Negro, Argentina, April 20, 1999.
150. Keynote Lecturer, “Chemical Synthesis of Intermetallic Compounds by the Vapor–Phase Reduction of Metal Chloride Mixtures,” XI Congreso Argentino de Fisicoquímica y I Congreso de Fisicoquímica del Mercosur, Santa Fe, Argentina, April 19–23, 1999.
151. Keynote Lecturer, “A Novel Bottom–Gas–Injected Solvent Extraction Process without Mechanical Agitation,” IX International Congress on Extraction Metallurgy, Hermosillo, Sonora, Mexico, May 26–29, 1999.
152. Short course, “Environmentally Driven Technologies: Primary Copper Industry,” at Global Symposium on Recycling, Waste Treatment and Clean Technology, TMS Fall 1999 Extraction and Process Metallurgy Meeting, San Sebastian, Spain, September 5-9, 1999.
153. “Chemical Synthesis of Intermetallic Compounds,” Departments of Material Science and Engineering and of Material Processing Engineering, Nagoya University, Nagoya, Japan, May 16, 2000.
154. Short course, “Sulphide Smelting: Principles, Practice, New Technologies and Environmental Considerations,” with N.J. Themelis in Conjunction with MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia,, September 9-10, 2000.
155. Keynote Lecturer, “A Novel Solvent Extraction Process with Bottom Gas Injection in a Horizontal Contactor,” MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia,, September 9-10, 2000.
156. Plenary Lecture, “Nonferrous Metals Production: Advances in Process Technology and Environmental Protection,” Second International Conference on Processing Materials for Properties, MMIJ (Japan) and TMS (U.S.), San Francisco, California, November 5-8, 2000.
157. “Chemical Vapor Synthesis of Ultrafine Intermetallic Powders and Coatings by the Coreduction of Chloride Mixtures,” Chrysalis Technologies, Inc., Richmond, Virginia, November 17, 2000.
158. “A Novel Cyclic Process for Reducing Sulfur Dioxide to Elemental Sulfur Involving CaS and CaSO4 without Generating Pollutants,” Szekely/Muchi Symposium on Materials Processing, Nagoya University, Nagoya, Japan, 2001.
159. “Remembrance of Two Pioneers in Materials Processing,” Szekely/Muchi Symposium on Materials Processing, Nagoya University, Nagoya, Japan, 2001.
160. Plenary Lecture, “Basic Principles of Sulfide Smelting and Converting with Oxygen-Rich Gas,” Third International Sulfide Smelting Symposium: Sulfide Smelting ’02, Seattle, Washington, February 17-21, 2002.
161. Short course, “The Principles and Practice of High-Temperature Chemical Metallurgy,” under the auspices of Andes Foundation at the University of Concepcion, Concepcion, Chile, September 9 – 12, 2002.
162. “A Novel Process for Reducing Sulfur Dioxide to Elemental Sulfur Involving CaS and CaSO4 without Generating Pollutants,” El Teniente Smelter, CODELCO, Caletones, Chile, September 13, 2002.
163. “Flash Converting Technology,” Chagres Smelter, Exxonmobil, Disputada las Condes, Chile, September 16, 2002.
164. “A Novel Solvent Extraction Process with Bottom Gas Injection,” Inst. for Innovation in Mining and Metallurgy, Santiago, Chile, September 23, 2002.
165. “A Novel Process for Reducing Sulfur Dioxide to Elemental Sulfur Involving CaS and CaSO4 without Generating Pollutants,” Inst. for Innovation in Mining and Metallurgy, Santiago, Chile, September 23, 2002.
166. “Flash Converting Technology,” Inst. for Innovation in Mining and Metallurgy, Santiago, Chile, September 23, 2002.
167. Short Course, “Sulfide Smelting: Principles, Technologies, and Environmental Considerations,” with K. Itagaki, and F. Kongoli, in Conjunction with 132nd TMS Annual Meeting, San Diego, California, March 1-2, 2003.
168. Keynote Lecturer, “Thermodynamics and Fluid-Solid Reaction Kinetics: Effects on the Rate and Activation Energy,” Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, 132nd TMS Annual Meeting, San Diego, California, March 2-6, 2003.
169. “The Status and Promises of Nanomaterials,” Research Institute of Electro Magnetic Sciences and Technology, Chungnam National University, Daejeon, Korea, May 10, 2004.
170. “\_\_\_\_,” Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea, May 11, 2004.
171. “Chemical Vapor Synthesis of Nano-Sized Metallic and Composite Powders,” Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea, May 12, 2004.
172. “Chemical Vapor Synthesis of Nano-Sized Metallic and Composite Powders,” Korea Atomic Energy Research Institute, Daejeon, Korea, May 12, 2004.
173. “Computer Modeling of Flash Smelting/Converting Processes,” LG-Nikko, Onsan, Korea, May 13, 2004.
174. “Rate Principles in the Gaseous Reduction of Iron Oxide,” POSCO, Pohang, Korea, May 14, 2004.
175. “The Status and Promises of Nanomaterials,” Technology Innovation Center, Hoseo University, Asan, Korea, May 17, 2004.
176. “Status and Promises of Nanomaterials: **Chemical Vapor Synthesis** of Nano-Sized Composite Powders,” College of Engineering, Wonkang University, Iksan, Korea, May 18, 2004.
177. “Status and Promises of Nanomaterials: Chemical Vapor Synthesisof Nano-Sized Composite Powders,” Joint Departments of Chemical Engineering and of Materials Science and Engineering Seminar, Chonju, Korea, May 18, 2004.
178. “Chemical Vapor Synthesis of Inorganic Nanopowders,” Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea, October 28, 2005.
179. “Chemical Vapor Synthesis of Inorganic Nanopowders,” Korea Institute of Machinery and Materials, Changwon, Korea, October 31, 2005.
180. “Hydrogen Reduction of Iron Oxide --- A New Perspective,” Graduate Institute of Ferrous Technology, Pohang, Korea, November 1, 2005.
181. “The Role and Structure of Corporate R&D in the Virtual Age,” LS-Nikko, Onsan, Korea, November 2, 2005.
182. “Chemical Vapor Synthesis of Inorganic Nanopowders,” Chungnam National University, Daejeon, Korea, November 4, 2005.
183. Invited Lecturer, “Rate Processes in the Suspension Reduction of Iron Ore Concentrate,” ’06 International Conference on Agglomeration of Iron Ores, Changsha, Hunan, China, November 3-6, 2006.
184. “Chemical Vapor Synthesis of Inorganic Composite and Hydrogen-Storage Nanopowders,” School of Metallurgical Science and Engineering, Central South University, Changsha, Hunan, China, November 6, 2006.
185. “Hydrogen Storage System as a Component in Developing Hydrogen Economy,” School of Materials Science and Engineering, Nagoya University, Nagoya, Japan, November 23, 2006.
186. “Fundamentals of Rate Processes in the Gaseous Reduction of Iron Oxide,” The 4th International Congress on the Science and Technology of ironmaking, Osaka, Japan, November, 26 to 30, 2006.
187. “Hydrogen Storage System as a Component in Developing Hydrogen Economy,” Dept. of Energy Science & Technology, Kyoto University, Kyoto, Japan, November 29, 2006.
188. “What's new in hydrogen storage materials development? H-Storage System as a Component in Developing H-Economy,” Central Metallurgical Research and Development Institute, Cairo, Egypt, March 19, 2007.
189. “Gas-solid reaction analysis: Let's clarify common misconceptions,” Central Metallurgical Research and Development Institute, Cairo, Egypt, March 20, 2007.
190. Short course, “**Metallurgical Process Principles and Practices – Silicon production and processing, Titanium extraction,** Thermodynamic principles of high-temperature extraction processes, Sulfide smelting and converting, Basic principles of heterogeneous reaction rate analysis,” China Yunnan Metallurgical Group (CYMG), Kunming, Yunnan, China, May 9 – 11, 2007.
191. “Improved Design of the Mitsubishi Furnace Lance,” LS-Nikko, Onsan, Korea, November 30, 2007.
192. “Plasma-Assisted Chemical Vapor Synthesis of Nanopowders,” 2nd International Conference on New Trends in Chemistry and Their Applications, Hurghada, Egypt, Feb. 13 – 15, 2008.
193. “Novel Ironmaking Technology with Low Energy Requirement and CO2 Emission,” Workshop on Carbon Management in Manufacturing Industries, GCEP, Stanford University, Stanford, California, April 15-16, 2008.
194. **Congressional Briefing**, “Novel Ironmaking Technology with Low Energy Requirement and CO2 Emission,” 3rd Annual AISI Environmental Briefing on Capitol Hill, Washington, DC, April 21, 2008.
195. “Novel Ironmaking Technology with Low Energy Requirement and CO2 Emission,” 2008 AISI General Meeting, Scottsdale, Arizona, May 4-6, 2008.
196. “Research Expertise and Activities at the University of Utah Department of Metallurgical Engineering: Reduction of CO2 Emission in Ironmaking and Steelmaking,” ArcelorMittal, East Chicago, IN, June 12, 2008.
197. “Novel Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” International Iron and Steel Inst. (IISI) CO2 Breakthrough Programme Meeting, Oita, Japan, September 4-5, 2008.
198. “An AISI-Utah Project on Novel Green Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” LS-Nikko, Onsan, Korea, December 19, 2008.
199. “Scale-Up Process Simulation, Nanopowder Production from Waste Silicon Sludge,” Korea Institute of Geoscience and Mineral Resources, Daejeon, Korea, December 12. 2008.
200. “What's new in hydrogen storage materials development?” Hungarian Academy of Sciences - Institute of Isotopes, Budapest, Hungary, March 19, 2009.
201. “An Overview of the Development of Hydrogen and a Novel Hydrogen Ironmaking Technology,” Vienna University of Technology, Institute of Chemical Engineering, Vienna, Austria, March 23, 2009.
202. “An AISI-Utah Project on Novel Green Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” Faculty of Metallurgy, Technical University Košice, Košice, Slovakia, March 26, 2009.
203. “Gas-Solid Suspension Ironmaking,” Asia-Pacific Partnership Meetings in conjunction with AISTech 2009, May 4 – 7, 2009.
204. “Gas-solid reaction analysis: Let's clarify common misconceptions,” School of Metallurgical Science and Engineering, Central South University, Changsha, Hunan, China, October 13, 2009.
205. “An AISI-Utah Project on Novel Green Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” School of Mineral Processing and Extractive Metallurgy, Central South University, Changsha, Hunan, China, October 13, 2009.
206. “What's new in hydrogen storage materials development?” School of Materials Science & Engineering, Shanghai Jiao Tong University, Shanghai, China, October 19, 2009.
207. “Experimental and Mathematical Investigations on Copper Smelting Processes: Kennecott-Outokumpu Flash Converting Process and New Mitsubishi Lance Design,” Aditya Birla Science and Technology Co. Mumbai, India, Dec. 7, 2009
208. Plenary lecture, “A Novel Green Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” International Conference on the Advances in Theory of Ironmaking and Steelmaking (ATIS), Indian Institute of Science, Bangalore, India, December 9 - 11, 2009.
209. “What's new in hydrogen storage materials development?” Banaras Hindu University, Varanasi, India, Dec. 16, 2009.
210. “An AISI-Utah Project on Novel Green Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption," Banaras Hindu University, Varanasi, India, Dec. 16, 2009.
211. “Chemical Vapor Synthesis of Inorganic Nanopowders,” Department of Chemical Engineering, Indian Institute of Technology – Delhi, Dec. 21, 2009.
212. Invited Lecturer, “Progress Report on the AISI-Utah Project: Novel Ironmaking Technology with Greatly Reduced CO2 Emission and Energy Consumption,” International Symposium on Ironmaking for Sustainable Development 2010 (ISISD 2010), Osaka, Japan, January 28 – 29, 2010.
213. Keynote Lecture, “Development of a Novel Gas-Suspension Ironmaking Technology with Greatly Reduced Energy Consumption and CO2 Emission,” 1st International Symposium on High-Temperature Metallurgical Processing (1st ISHTMP), 139th TMS Annual Meeting, Seattle, Washington, February 14-18, 2010.
214. “Sohn Laboratory: High-Temperature Gas-Solid Reaction and related Research Activities at the University of Utah,” Shanghai University, Shanghai, China, Aug. 30, 2010.
215. “Development of a Novel Green Ironmaking Technology,” Research Institute, Baoshan Iron & Steel Co., Shanghai, China, Aug. 31, 2010.
216. “Development of a Novel Green Ironmaking Technology,” Shanghai University, Shanghai, China, Sept. 2, 2010.
217. “The Future for Metallurgical Engineering: Ironmaking and Steelmaking,” Chongqing University, Chongqing, China, Sept. 8, 2010.
218. “A Novel Technology for Ironmaking,” Chongqing University, Chongqing, China, Sept. 9, 2010.
219. “Fluidization Processes and Principles: Application to reduction of minerals,” Chongqing University, Chongqing, China, Sept. 10, 2010.
220. “Development of Hydrogen-Storage Materials,” University of Ljubljana, Ljubljana, Slovenia, June 20, 2011.
221. “Bridging Different Disciplines in Process Metallurgy and Materials Synthesis,” Symposium on the Production and Application of Nonferrous Metals, The Korean Institute of Metals and Materials, Seoul, Korea, August 9, 2011.
222. “Bridging Different Disciplines in Process Metallurgy and Materials Synthesis,” RIST, Korea, August 16, 2011.
223. “Development of a Novel Gas-Suspension Ironmaking Technology with Greatly Reduced Energy Consumption and CO2 Emissions,” GIFT-POSTECH, Pohang, Korea, August 17, 2011.
224. “Bridging Different Disciplines in Process Metallurgy and Materials Synthesis,” LS-Nikko Co., Onsan, Korea, August 18, 2011.
225. “Present Status of EAF Dust Treatment in North America,” International Symposium on EAF Dust Treatment in conjunction with Iron Steel Inst. Japan (ISIJ) 2012 Annual Meeting, Yokohama, Japan, March 20, 2012.
226. “Bridging and Fusion of Disciplines in Technology Development,” Korean Scientists and Engineers Association Meeting, Salt Lake City, Utah, September 15, 2012.
227. Keynote Lecture, “Novel Flash Ironmaking Technology with Greatly Reduced Energy Consumption and CO2 Emissions,” 6th Intl Congress on Sci. and Tech. of Ironmaking (ICSTI ’12), Rio de Janeiro, Brazil, October 14 – 18, 2012.
228. “Computational Fluid Dynamic (CFD) modeling of copper flash smelting and converting,” First Metallurgical Meeting, Lima, Peru, October 26-27, 2012.
229. “Novel Flash Ironmaking Technology with Greatly Reduced Energy Consumption and CO2 Emissions,” First Metallurgical Meeting, Lima, Peru, October 26-27, 2012.
230. “Copper Smelting and Converting Process Comparison,” First Metallurgical Meeting, Lima, Peru, October 26-27, 2012.
231. “Introduction to Sohn Laboratory,” ArcelorMittal, East Chicago, IN, August 8, 2013.
232. “Issues in the Development of Novel Flash Ironmaking Technology,” ArcelorMittal, East Chicago, IN, August 8, 2013.
233. “Development of a Novel Flash Ironmaking Technology,” Dong-A University, Busan, Korea, August 12, 2013.
234. “Development of a Novel Flash Ironmaking Technology,” LS-Nikko, Onsan, Korea, August 14, 2013.
235. “Novel Flash Ironmaking Technology,” Matoba Memorial Kawatabi Seminar (Japanese equivalent of Gordon Conferences), Sendai, Japan, August 22-23, 2013.
236. “From Sulfide Flash Smelting to a Novel Flash Ironmaking Technology,” Keynote paper in Celebrating the Megascale: EPD Symposium on Pyrometallurgy in Honor of David G. C. Robertson, 143rd TMS Annual Meeting, San Diego, California, 2014.
237. “Determination of Energy Requirements for Ironmaking Processes: It’s Not That Straightforward,” Keynote paper in Energy Technology 2014 Carbon Dioxide Management and Other Technologies, 143rd Annual TMS Meeting, San Diego, California, 2014.
238. “Titanium Production Technologies and Application,” Korea Institute of Geoscience and Mineral Resources (KIGAM), Daejeon, Korea, October, 2018.

(plus > 200 other meeting abstracts, conference presentations, and seminars)

**PROFESSIONAL MEETINGS CHAIRED**

1. Processing 1—Principles and Applications (with W. M. McKewan), 106th AIME Annual Meeting, Atlanta, Georgia, March 6–10, 1977.
2. Coal Gasification Reactions (with W. P. Haynes), 106th AIME Annual Meeting, Atlanta, Georgia, March 6–10, 1977.
3. Processing V—Principles and Applications (with J. E. Stukel), 107th AIME Annual Meeting, Denver, Colorado, February 26–March 2, 1978.
4. Heterogeneous Reactions (with F. Habashi), 1978 Engineering Foundation Conference on Particle Science and Engineering in the Process Industries, Pacific Grove, California, June 18–23, 1978.
5. Extractive and Process Metallurgy, 109th AIME Annual Meeting, Las Vegas, Nevada, February 24–28, 1980.
6. Kinetics III: Iron Oxide (with C. E. Seaton), 109th AIME Annual Meeting, Las Vegas, Nevada, February 24–28, 1980.
7. Alternate Energy Sources (with G. de la Mora), AIChE–IMIQ Joint Meeting/XX Convencion Nacional del Institute Mexicano de Ingenieros Quimicos, Acapulco, Mexico, October 15–17, 1980.
8. Coal/Shale Utilization (with M. Castaneda and S. C. Wiener), AIChE–IMIQ Joint Meeting/XX Convencion Nacional del Instituto Mexicano de Ingenieros Quimicos, Acapulco, Mexico, October 15–17, 1980.
9. Metallurgy: Fundamentals (with Z. Kozuka), Fourth MMIJ–AIME Joint Meeting, Tokyo, Japan, November 4–8, 1980.
10. Kinetics I: Ironmaking and Steelmaking (with R. J. Fruehan), 110th AIME Annual Meeting, Chicago, Illinois, February 22–26, 1981.
11. Symposium on Extractive Metallurgy of Refractory Metals IV: Zirconium and Hafnium (with D. R. Spink), 110th AIME Annual Meeting, Chicago, Illinois, February 22–26, 1981.
12. Symposium on Extractive Metallurgy of Refractory Metals V: Chromium (with W. D. Klopp), 110th AIME Annual Meeting, Chicago, Illinois, February 22–26, 1981.
13. Symposium on Extraction and Processing of Energy Minerals—Part I (with J.–M. Wie), 1981 AIChE Spring National Meeting, Houston, Texas, April 5–9, 1981.
14. Symposium on Extraction and Processing of Energy Minerals—Part II (with K. V. S. Sastry), 1981 AIChE Spring National Meeting, Houston, Texas, April 5–9, 1981.
15. Symposium on Chemical Engineering in Metals Extraction (with S. D. Hill), 1981 AIChE Spring National Meeting, Houston, Texas, April 5–9, 1981.
16. Kinetics I: Modeling (with P. R. Taylor), 111th AIME Annual Meeting, Dallas, Texas, February 14–18, 1982.
17. Processing II: Non–Ferrous Pyrometallurgy (with J. E. Pahlman), TMS–AIME 112th Annual Meeting, Atlanta, Georgia, March 6–10, 1983.
18. Alternate Energy (with K. Yoshida), PACHEC '83, Third Pacific Chemical Engineering Congress, Seoul, Korea, May 8–11, 1983.
19. Thermodynamics (with Y. Matsushita), Japan–U.S. Seminar on Advances in the Science of Iron– and Steelmaking, Kyota, Japan, May 16–20, 1983.
20. Symposium on Metals and Minerals Processing I (with H. P. Hsieh), 1983 AIChE Summer National Meeting, Denver, Colorado, August 28–31, 1983.
21. Symposium on Metals and Minerals Processing II (with H. P. Hsieh), 1983 AIChE Summer National Meeting, Denver, Colorado, August 28–31, 1983.
22. Symposium on Metals and Minerals Processing III (with H. P. Hsieh), 1983 AIChE Summer National Meeting, Denver, Colorado, August 28–31, 1983.
23. Symposium on Recovery of Metal Values from Industrial Wastes I (with C. N. Haas), 1983 AIChE Summer National Meeting, Denver, Colorado, August 28–31, 1983.
24. Symposium on Recovery of Metal Values from Industrial Wastes II (with C. N. Haas), 1983 AIChE Summer National Meeting, Denver, Colorado, August 28–31, 1983.
25. Plenary Session (with D. B. George), 1983 TMS–AIME Extractive and Process Metallurgy Fall Meeting and International Sulfide Smelting Symposium, San Francisco, California, November 6–9, 1983.
26. Summary Session (with A. D. Zunkel), 1983 TMS–AIME Extractive and Process Metallurgy Fall Meeting and International Sulfide Smelting Symposium, San Francisco, California, November 6–9, 1983.
27. Kinetics II: Oxidation and Reduction Reactions/Nonferrous (with R. J. Fruehan), 113th TMS–AIME Annual Meeting, Los Angeles, California, February 26–March 1, 1984.
28. Kinetics II: Nonferrous Systems (with T. DebRoy), 114th TMS–AIME Annual Meeting, New York, New York, February 24–28, 1985.
29. Plenary Session (with P. R. Taylor and N. Jarrett), 1985 TMS–AIME Extractive and Process Metallurgy Fall Meeting and International Symposium on Recycle and Secondary Metals, Fort Lauderdale, Florida, December 1–4, 1985.
30. Recovery of Copper (with R. E. Siemens), 1985 TMS–AIME Extractive and Process Metallurgy Fall Meeting and International Symposium on Recycle and Secondary Metals, Fort Lauderdale, Florida, December 1–4, 1985.
31. Reactions of Sulfide Minerals, Center for Pyrometallurgy Conference on Gas–Solid Reactions, West Lafayette, Indiana, April 25–26, 1986.
32. Energy Conservation and Analysis (with F. Ogino), Session 6–a, World Congress III of Chemical Engineering, Tokyo, Japan, September 21–25, 1986.
33. Reaction Kinetics (with T. Furusawa), Session 9–a, World Congress III of Chemical Engineering, Tokyo, Japan, September 21–25, 1986.
34. Developments in Hydrometallurgy (with J. E. Hoffman), 1986 TMS–AIME Extractive and Process Metallurgy Fall Meeting and The Reinhardt Schuhmann International Symposium on Innovative Technology and Reactor Design in Extraction Metallurgy, Colorado Springs, Colorado, November 9–12, 1986.
35. Non–Ferrous I, 1987 TMS–AIME Extractive and Process Metallurgy Fall Meeting, The Mathematical Modeling of Materials Processing Operations, Palm Springs, California, November 29–December 2, 1987.
36. Industrial and Pilot–Plant Operations, Center for Pyrometallurgy Conference on Flash Reaction Processes, Salt Lake City, Utah, June 15–17, 1988.
37. Plenary Session (with E. S. Geskin), International Symposium on Metallurgical Processes for the Year 2000 and Beyond, Las Vegas, Nevada, February 27–March 1, 1989.
38. Metals and Materials Processing III (with D. R. Morris), International Symposium on Metallurgical Processes for the Year 2000 and Beyond, Las Vegas, Nevada, February 27–March 1, 1989.
39. Process Fundamentals III: Thermodynamics and Reaction Kinetics in Metallurgical Processes B (with D. R. Gaskell), 119th TMS Annual Meeting, Anaheim, California, February 18–22, 1990.
40. Extraction Metallurgy of Rare Metals (with H. Fukushima), Rare Metals '90—International Symposium on Processing of Rare Metals, Kokura, Kitakyushu, Japan, November 14–16, 1990.
41. Refractory Metals III: Chemical and Thermal Processing (with R. G. Bautista), 120th TMS Annual Meeting, New Orleans, Louisiana, February 17–21, 1991.
42. Process Fundamentals II (with N. El–Kaddah), 120th TMS Annual Meeting, New Orleans, Louisiana, February 17–21, 1991.
43. Processing of Residues and Effluents VII (with V. Ramachandran), International Symposium on Nonferrous Flue Dust, 121st TMS Annual Meeting, San Diego, California, March 1–5, 1992.
44. General Pyrometallurgy II (with L. G. Twidwell), 121st TMS Annual Meeting, San Diego, California, March 1–5, 1992.
45. Flash Smelting, Paul E. Queneau International Symposium on Extractive Metallurgy of Copper, Nickel and Cobalt (with H. H. Kellogg), 122nd TMS Annual Meeting, Denver, Colorado, Feb. 21–25, 1993.
46. Copper, Nickel, Zinc, Lead, Tin and Their Byproducts (with Z. Asaki), First International Conference on Processing Materials for Properties, MMIJ and TMS, Honolulu, Hawaii, November 7–10, 1993.
47. Plenary Session (with D. G. C. Robertson), Second International Symposium on Metallurgical Processes for the Year 2000 and Beyond and the 1994 TMS Extraction and Process Metallurgy Meeting, San Diego, California, September 20–23, 1994.
48. Recycling, Waste Treatment and Environmental Issues II (with D. D. Harbuck), Second International Symposium on Metallurgical Processes for the Year 2000 and Beyond and the 1994 TMS Extraction and Process Metallurgy Meeting, San Diego, California, September 20–23, 1994.
49. General Pyrometallurgy I (with J. D. McCain), 125th TMS Annual Meeting, Anaheim, California, February 4–8, 1996.
50. Gas–Solid Reactions (with J. W. Evans), The Julian Szekely Memorial Symposium on Materials Processing, The 1997 TMS Fall Extraction and Processing Conference, Cambridge, Massachusetts, October 5–8, 1997.
51. Preparation of Intermetallic Compounds (with W. D. Cho), International Symposium on Value Addition Metallurgy, 127th TMS Annual Meeting, San Antonio, Texas, February 15–19, 1998.
52. Thin Films and Coatings I (with K. Liddell), International Symposium on Value Addition Metallurgy, 127th TMS Annual Meeting, San Antonio, Texas, February 15–19, 1998.
53. Physical Chemistry, Modeling, Innovative Techniques (with Zhao Ruirong), The Third International Conference on Hydrometallurgy, Kunming, China, November 3–5, 1998.
54. Fluid–Flow Phenomena in Metals Processing: Metals Extraction and Smelting (with S. A. Argyropoulos), 128th TMS Annual Meeting, San Diego, California, February 28–March 4, 1999.
55. Aluminum Recycling – II (with B. Kos), Global Symposium on Recycling, Waste Treatment and Clean Technology, TMS Fall 1999 Extraction and Process Metallurgy Meeting, San Sebastian, Spain, September 5-9, 1999.
56. Professional Development and Education Issues, MINPREX 2000: International Congress on Mineral Processing and Extractive Metallurgy, Melbourne, Australia,, September 9-10, 2000.
57. Copper, Nickel, Zinc, Lead and Tin – II (with T. Okura), Second International Conference on Processing Materials for Properties, MMIJ (Japan) and TMS (U.S.), San Francisco, California, November 5-8, 2000.
58. Plenary Session: From Fundamentals to New Projects (with R. L. Stephens), Third International Sulfide Smelting Symposium – “Sulfide Smelting ‘02”, 131st TMS Annual Meeting, Seattle, Washington, February 17-21, 2002.
59. Plenary Session (with F. Kongoli), Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, San Diego, California, March 2-6, 2003.
60. Kinetics and Thermodynamics (with D. J. Fray), Yazawa International Symposium on Metallurgical and Materials Processing: Principles and Technologies, San Diego, California, March 2-6, 2003.
61. Keynote Session (with Tatsuro Ariyama), International Symposium on Ironmaking for Sustainable Development 2010 (ISISD 2010), Osaka, Japan, January 28 – 29, 2010.
62. Pyrometallurgy III, Copper2010, Hamburg, Germany, June 6 – 10, 2010.
63. New and emerging technologies, 6th Intl Congress on Sci. and Tech. of Ironmaking (ICSTI ’12), Rio de Janeiro, Brazil, Oct. 14 – 18, 2012.
64. Oxides 2 (with Tetsuo Tsuchiya), 21st Annual International Conference on Composites/Nano Engineering (ICCE-21), Tenerife, Canary Islands, Spain, July 21-27, 2013.
65. Mineral Processing & Safety I (with Ying Pio Lim), 2nd International Conference on Mining, Material and Metallurgical Engineering (MMME), Barcelona, Spain, July 20-21, 2015.
66. Biomedical Materials, 2nd International Conference on Mining, Material and Metallurgical Engineering (MMME), Barcelona, Spain, July 20-21, 2015.
67. Plenary Session, Symposium: Applications of Process Engineering Principles in Materials Processing, Energy and Environmental Technologies: An EPD Symposium in Honor of Professor Ramana G. Reddy, 146th TMS Annual Meeting, San Diego, California, February 26–March 2, 2017.

**DISSERTATIONS AND THESES SUPERVISED**

**Metallurgical Engineering**

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| --- | --- | --- | --- | --- |
| Name | Degree | Year | Dissertaion/Thesis Title | Note |
| Rene Antezana | M.S. | 1977  (9/75–2/77) | Dissolution of Stibnite with Sodium Sulfide Solutions Using the Rotating Disc Technique | with J.D. Miller |
| N. Robert Sorensen and Mervin Veo Jones | B.S. | 1977  (10/76–6/77) | The Liquid Phase Degradation of Shale Oil |  |
| Rafael Padilla Duran | M.S. | 1977  (3/76–12/77) | The Reduction of Cassiterite with Carbon | LASPAU Fellowship |
| Donna M. Dickson | B.S. | 1978  (6/77–6/78) | The Cracking and Polymerization of Shale Oil in Liquid Phase | Current name: Donna M. Harbuck |
| Sungkuk Won | Ph.D. | 1979  (9/75–9/79) | Hydrogen Reduction of Chalcocite in the Presence of Lime |  |
| Daesoo Kim | Ph.D. | 1980  (6/76–10/80) | The Oxidation of Metal Sulfides with Lime in the Presence of Steam |  |
| Sun Kyu Kim | Ph.D. | 1980  (1/78–7/80) | The Determination of the Kinetics of Gas–Solid Reactions by the Nonisothermal Technique |  |
| Frederick Edward Woodward Duvall | M.S. | 1982  (6/79–9/81) | Physical Behavior of Oil Shale at Various Temperatures and Compressive Loads | MMRI Fellowship |
| Jane Wadsworth Morrison | M.S. | 1984  (9/79–11/81) | Hydrogen Reduction of Chalcocite and Chalcopyrite | MMRI Fellowship |
| Rafael Padilla Duran | Ph.D. | 1984  (9/79–3/84) | Alumina from Coal Wastes by the Lime–Soda Sinter Process |  |
| Donna Myra Dickson | M.S. | 1982  (1/80–8/82) | Alumina from Coal Wastes Through the Formation of Aluminum Nitride | Current name: Donna M. Harbuck |
| Mark Carl Bronson | M.S. | 1982  (6/80–12/81) | Carbothermal Reduction of Nickel Sulfide in the Presence of Lime | MMRI Fellowship |
| Kang–In Rhee | Ph.D. | 1988  (8/81–7/88) | Selective Chlorination of Iron from Low–Grade Titanium Ore in a Fluidized–Bed Reactor | U Graduate Research Fellowship |
| Hsing Kuang Lin | Ph.D. | 1985  (9/80–8/85) | Leaching of Copper from Primary Copper Ore under Solution–Mining Conditions |  |
| Shome Nath Sinha | Ph.D. | 1984  (9/79–6/84) | Distribution of Iron, Lead, Cobalt, Tin, Silver, and Gold between Copper and Matte |  |
| Napoleon Jacinto | M.S. | 1982  (9/80–6/82) | Thermodynamic Properties of Copper, Nickel, and Cobalt Sulfates | LASPAU Fellowship |
| Pinakin Chintamani Chaubal | Ph.D. | 1986  (9/80–8/86) | The Reaction of Chalcopyrite Concentrate Particles in a Flash Furnace Shaft | U Graduate Research Fellowship |
| Yoon Bong Hahn | Ph.D. | 1988  (9/82–6/88) | Mathematical Modeling of Chalcopyrite Concentrate Combustion in an Axisymmetric Flash–Furnace Shaft | U Graduate Research Fellowship |
| Syoni Soepriyanto | M.S. | 1986  (9/83–6/86) | The Selective Oxidation of Mixed Metal Sulfides Using Lime in the Presence of Steam |  |
| Mohamed Belgasem Aboukheshem | Ph.D. | 1989  (12/83–6/89) | Gas–Solid Reaction Rate Enhancement by Pressure Cycling |  |
| Hyun-deok Baek | M.E. | 1986  (3/85–3/86) | Computerized Process Calculation and Analysis of Copper Flash Smelting |  |
| Donald Rene Wall | Ph.D. | 1988  (6/85–8/88) | The Removal of Carbonaceous Residue in Greensheet Processing for Multilayer Ceramic Module |  |
| Xiaoli Wang | Ph.D. | 1993  (9/87–3/93) | Self–Propagating High–Temperature Synthesis of Nickel and Titanium Aluminides |  |
| Hang–Goo Kim | Ph.D. | 1993  (9/86–12/93) | Minor Element Behavior in Pyrometallurgical Coppermaking Systems (on my project since 10/87) | MMRRI Fellowship |
| Kumar Moorthy Iyer | Ph.D. | 1992  (7/88–9/92) | Physical and Mathematical Modeling of Pyrometallurgical Channel Reactors | U Graduate Research Fellowship |
| Hong Qing Tang | M.S. | 1991  (1/89–9/91) | Mathematical Modeling of Gas–Solid Flash Reactions |  |
| Ling Zhou | Ph.D. | 1994  (4/89–8/93) | Fluidized Bed Chlorination of Several Titaniferous Materials—Kinetics, Morphological Changes and Mathematical Modeling | U Graduate Research Fellowship |
| Dong–Hoon Han | Ph.D. | 1998  (6/89–9/98) | Calcined Calcium Magnesium Acetate (CMA) as a New High–Performance Sulfur Dioxide Absorbent |  |
| Sohini Pal Dey | Ph.D. | 1996  (9/90–12/95) | Synthesis of Intermetallic Compounds by Vapor–Phase Coreduction of Metal Chlorides | U Graduate Research Fellowship |
| Rene R. Fernandez | M.S. | 1993  (9/90–6/93) | Process for Treating Refractory Gold Ores by Roasting under Oxidizing Conditions |  |
| Yutaka Yasuda | M.S. | 1993  (6/91–6/93) | Particle Dispersion Phenomena in a Turbulent Gas Jet of the Flash Smelting Process |  |
| Syed Mohammad Asad Abbas Zaidi | M.S. | 1994  (9/91–1/94) | Drop–Size Distribution in Liquid–Liquid Emulsions Formed by Bottom Gas Injection |  |
| Byung–Su Kim | Ph.D. | 1999  (1/94-8/99) | Reduction of Sulfur Dioxide to Elemental Sulfur by Cyclic Process Involving Calcium Sulfide and Sulfate |  |
| Johanna Löttiger | M.S. | 1995 | Oxidation Characteristics of Solid Copper Matte Particles  (Research at the University of Utah, Degree at the Royal Institute of Tech., Sweden) |  |
| Daniel Anders Gustaf Swartling | M.S. | 1996 | Study of Particle Fragmentation in a Laboratory–Scale Simulation of the Flash Converting of a Copper Matte  (Research at the University of Utah, Degree at the Royal Institute of Tech., Sweden) |  |
| Kirsi Marjaana Riihilahti | Licen-tiate | 1997  (8/94–2/98) | Oxidation of Copper Matte Particles under Simulated Flash Converting Conditions (Research at the Univ. of Utah, Degree at the Helsinki University of Tech., Finland) |  |
| Marijanka Savic | M.S. | 2006  (8/00-8/04) | Reduction of Sulfur Dioxide to Elemental Sulfur by a Cyclic Process Involving Barium Sulfide and Barium Sulfate |  |
| B. S. Choi | Ph.D. | 2005  (12/01-8/05) | Crystallization Characteristics of NaCl Crystal Size Distribution Associated with a CMSMPR Crystallizer | Acting Chair for T.A. Ring in Ch. E. |
| Oladapo Eso | Ph.D. | 2006  (8/01-11/06) | Liquid Phase Sintering of Functionally Graded WC-Co Composites | Co-Chair with Z. Z. Fang |
| Manolete ‘Odie’ Mamauag Mena | M.S. | 2006  (3/03-8/06) | Chemical Vapor Synthesis of WC-Co Nanoparticles | Copper-Hansen Fellowship |
| Nuttiraporn Terdkiatikul | M.E. | 2005  (8/03-8/05) | Carbothermic Reduction of Metal Sulfides in the Presence of Lime |  |
| Praveen Maheshwari | M.S. | 2005  (8/03-5/05) | Early-Stage Densification and Grain Growth of Nanosized WC-Co Powders during Sintering | Co-Chair with Z. Z. Fang |
| Jun Lu | Ph.D. | 2008  (1/04-6/08) | Light Metal Alanates and Amides for Reversible Hydrogen Storage Application | Co-Chair with Z. Z. Fang |
| Edgar Blanco | M.S. | 2007  (4/04-1/06) | The Kinetics of Molybdenite Oxidation by Water Vapor |  |
| Moo Eob Choi | M.S | 2008  (8/04-5/08) | Effect of CaSO4 Pelletization Conditions on a Novel Process for Converting SO2 to Elemental Sulfur by Reaction Cycles Involving CaSO4/CaS |  |
| Xu Wang | Ph.D. | 2008  (8/04-7/08) | Grain Growth during the Early Stage of Sintering of Nanosized WC-Co Powder | Co-Chair with Z. Z. Fang |
| Taegong Ryu | Ph.D. | 2008  (8/04-6/08) | Chemical Vapor Synthesis (CVS) and Characterization of Tungsten Carbide-Cobalt Nanocomposite Powder | U Graduate Research Fellowship, Z. Z. Fang Co-Chair |
| Jin Won Choi | Ph.D. | 2009  (8/04-2/09) | Chemical Vapor Synthesis and Characterization of Metallic Nanopowders relevant to Hydrogen Storage Materials | Z. Z. Fang Co-Chair |
| Moo Eob Choi | Ph.D. | 2010  (8/06-5/10) | Suspension Hydrogen Reduction of Iron Ore Concentrate |  |
| Yanhui Ji | M.S. | 2007  (5/05-3/07) | CFD Simulation of Flame Spray Process for Silica Nanopowder Synthesis | Copper-Hansen Fellowship |
| Young Joon Choi | Ph.D. | 2009  (5/05-11/09) | Synthesis and Characterization of Light Metal Based Hydrides for Hydrogen Storage Materials | Z. Z. Fang Co-Chair |
| Yao ‘Max’ Zhang | M.S. | 2008  (12/05-7/08) | Bench-Scale Flash Reduction of Iron Ore Concentrate |  |
| Brady Glenn Butler | M.S. | 2008  (6/06-5/08) | Preparation of Complex Lithium Based Hydrogen Storage Materials Using a High Temperature Vapor Phase Reactor | Co-Chair with Z. Z. Fang |
| Kyu Sup Hwang | M.S. | 2008  (8/06-6/08) | Chemical Vapor Synthesis (CVS) of Tungsten Nanopowder in Thermal Plasma and Its Sintering Behavior | Copper-Hansen Fellowship |
| Sung Sil Park | M.S. | 2008  (8/06-9/08) | Penetration Behavior of an Annular Gas-Solid Jet Impinging on a Liquid Bath |  |
| Haitao Wang | Ph.D. | 2011  (8/06-5/11) | Reduction Kinetics of Iron Ore Concentrate Particles Relevant to a Novel Green Ironmaking Process | 2-time best TA – Dept; Best TA - College |
| Miguel Olivas-Martinez | Ph.D. | 2013  (1/07-8/13) | Computational Fluid Dynamic Modeling of Chemically Reacting Gas-Particle Flows | U Graduate Research Fellowship |
| Silvia Eugenia Perez-Fontes | Ph.D. | 1/07-8/15; 12/17- | CFD Modeling of a Flash Ironmaking Technology |  |
| Nurzhan Dyussekenov | M.S. | 2008  (1/07-12/08) | Investigation of the Penetration Depth of an Annular Gas-Solid Jet into a Liquid Bath |  |
| Haruka Kimura Pinegar | M.S. | 2010  (5/08-6/10) | Material and Energy Flow Simulation and Economic Analysis for a Novel Suspension Ironmaking Technology |  |
| Shuhua Sara Liu | M.S. | 2011  (8/08-5/11) | The Effect of FeO Activity on the Material and Energy Flow in a Novel Suspension Ironmaking Process |  |
| Su Hyun Hwang | M.S. | 2011  (8/08-5/11) | Phosphorus Removal from Manganese Ores by Plasma Treatment |  |
| Mohassab Yousef Mohassab-Ahmed | M.S. | 2011  (9/08-5/11) | Sulfur and Phosphorus Distribution Between Liquid Iron and Magnesia-Saturated Slag in H2/H2O Atmosphere Relevant to a Novel Green Ironmaking Technology |  |
| Samar Emami | Ph.D. | 2013  (8/13/09-9/1/13) | Formation and Evaluation of Protective Layer over Magnesium Melt under Various Gaseous Atmospheres |  |
| Yubo Gao | M.S. | 2011  (8/09-5/11) | Pre-Reduction and Magnetic Separation of Low Grade Manganese Ore |  |
| Liangzhu Zhu  (朱良柱) | Ph.D. | 2013  (8/09-8/13) | Preparation of High Aspect Ratio Particles through the High Temperature Growth of 2M-Wollastonite Crystals |  |
| Tyler Bronson | Ph.D. | 2015  (6/10-3/15) | Oxidation and Condensation of Zinc Fume in Steelmaking Off-Gas Systems |  |
| Zhixue ‘Chris’ Yuan | M.S. | 2013  (8/11-8/13) | Re-Oxidation Kinetics of Flash Reduced Iron Particles Relevant to a Novel Flash Ironmaking Process |  |
| Mohassab Yousef Mohassab-Ahmed | Ph.D. | 2013  (11/11-4/13) | Phase Equilibrium between Iron and Slag in CO/CO2/H2/H2O Atmospheres Relevant to a Novel Flash Ironmaking Technology |  |
| Omar Kergaye | B.S. | 2016 | Kinetics of the Reduction of Magnetite Concentrate Particles by CO + H2 Gas Mixture Relevant to a Novel Flash Ironmaking Process |  |
| Feng Chen | Ph.D. | 2015  (3/13–2/15) | Reduction Kinetics of Hematite Concentrate Particles by H2 + CO Mixtures Relevant to a Novel Flash Ironmaking Process | Degree at Central-South Univ., China |
| De-Qiu ‘Jerry’ Fan | Ph.D. | 2019  (5/13-5/19) | Computational Fluid Dynamic Analysis of Experimental Flash Ironmaking Reactors |  |
| Mohamed H. Elzohiery | Ph.D. | 2018  (8/13-4/19/18) | Flash Reduction of Magnetite Concentrate Related to a Novel Flash Ironmaking Process |  |
| Amr Refay Abdelghany | Ph.D. | 2018  (5/14-5/30/18) | Design of Flash Ironmaking Reactors with Computational Fluid Dynamics Modeling |  |
| Yuanpei Lan  (兰苑培) | Ph.D. | 2017  (10/14-10/16) | Plasma Synthesis of Advanced Ceramic Nanopowders | Degree at Chongqing  Univ., China |
| Rahul Sarkar | Ph.D. | 2019  (8/19/15-5/1/19) | Interactions of Iron, Wustite, and Slags with Selected Refractory Materials under Flash Ironmaking Conditions |  |
| Symantak Roy | Ph.D. | 2021  (7/1/16-12/21/21) | Hydrogen Reduction of Iron Ore  Concentrate in Loose Layers and Ccompacts |  |
| Arun Murali | M.S. | 2018  (8/12/16-4/24/18) | Plasma-Assisted Chemical Vapor Synthesis of Transparent Conducting Oxides and Their Applications as  Transparent Conducting Films |  |
| Ida Briland | M.S. | 2018  (11/1/17-4/27/18) | Reduction kinetics of regenerated  iron oxide from scale with  hydrogen | Degree at Royal Inst. of Technol., Stockholm, Sweden |
| John Otero | Ph.D. | (8/21/20- | Formation Mechanism and Kinetics of Zinc Ferrite (ZnFe2O4) in EAF Off-Gas | Outstanding TA – 2023 CMES |
| David Manczak | M.S. | (8/21/23- |  |  |
| Navid Radfar | Ph.D. | (10/25/23- | Simulation of DRI Shaft Furnace with CFD-DEM to Produce Green Steel Using Hydrogen Gas | Degree at Semnan University,  Semnan, Iran |

DISSERTATIONS AND THESES SUPERVISED (Cont’d)

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Degree | Year | Title |
| **Chemical Engineering** | | | |
| Kyung Won Seo | Ph.D. | 1990  (9/85–5/90) | Flash Reaction of Sulfide Mineral Particles in a Turbulent Gas Jet (started project 9/86) |
| Dusita Doungdeethaveeratana | M.S. | 1995  (3/93–5/95) | A Novel Solvent Extraction Process with Bottom Gas Injection |
| Manuel Perez–Tello | Ph.D. | 1999  (12/93-8/98) | Experimental Investigation and Computer Simulation of the Continuous Flash Converting Process of Solid Copper Mattes |
| Amr Abdelghany | Ph.D. | Stopped  (8/13-5/14) | (Research supervision by H. Y. Sohn; degree from Cairo University) |
| Kyle O’Malley | Ph.D. | 2020 | Preparation of Novel Bi-metallic Cu-NiO@SiO2 Oxygen Carrier and Kinetics Analysis |
| **Fuels Engineering** | | | |
| In Chul Lee | Ph.D. | 1984  (3/79–2/84) | Experimental Investigation and Mathematical Modeling of the Ignition of an Oil Shale Bed with Hot Air |
| Uday Navin Parekh | M.S. | 1981  (6/79–7/81) | Ignition of Oil Shale Beds with Hot Air |
| Hyun Soo Yang | Ph.D. | 1983  (8/79–9/83) | The Effect of Reduced Pressure on Oil Shale Retorting |
| Cathleen Ho–Ok Sun–Chang | M.S. | 1984  (4/80–6/83) | Hybrid Retorting of Oil Shale and Coal |

**Senior RESEARCH ASSOCIATES**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Status | Dates | Topic |
| Hongliang Zhao  (赵洪亮) | Lecturer**,** Univ. of Science and Technology Beijing, China | 12/19-10/20 | Various nonferrous chemical metallurgy |
| Lei Guo (郭磊) | Lecturer**,** State Key Laboratory of Adv. Metallurgy, Univ. of Science and Technology Beijing, China | 2/25/19-2/20 | Hydrogen reduction of iron oxide concentrate |
| Guozhi Lu (Lv)  (吕国志) | Assoc. Prof., Special Metallurgy and Process Engineering Inst., Northeastern Univ., No.3-11 Wenhua Road, Heping District, Shenyang City, Liaoning Province, P.R. China | 11/17-11/18 | Evaluation of refractories relevant to Flash Ironmaking Technology |
| Ricardo Morales Estrella | Professor, Dept of Metallurgy and Materials Science, Michoacan State Univ., Morelia, Michoacan, Mexico | 8/16-5/17 | Reduction reactivity of milled magnetite concentrate |
| Baoqiang 'Bob' Xu  (徐宝强) | Assoc. Prof., National Eng. Laboratory for Vacuum Metallurgy,  Faculty of Metallurgical and Energy Eng., Kunming Univ. of Sci. and Tech., Kunming, Yunnan, China | 3/15-3/16 | Plasma-Assisted Chemical Vapor Synthesis of Oxide Nanopowders |
| Young Hun Chae  (채영훈) | Professor, Department of Mechanical Eng., Kyungpook National University, Daegu, Korea | 1/15-12/16 |  |
| Shengqin Zhang  (张生芹) | School of Metallurgy and Materials Eng., Chongqing Univ. of Sci. & Tech., Chongqing, China | 8/14-8/15 | Flash Ironmaking Kinetics |
| Kai Xie  (谢锴) | Associate Professor,  School of Energy Sci. and Tech.  Central South University  Changsha, Hunan, 410083 China | 9/14-9/15 |  |
| Jianliang Wang  (汪金良) | Associate Professor, Jiangxi University of Sci. and Tech., Ganzhou, Jiangxi, China | 2/14-2/15 |  |
| Jagannath Pal | National Metallurgical Laboratory, Jamshedpur 831007, India | 1/14-5/14 | Gaseous Reduction of Iron Ore Concentrates |
| Michael S. Moats | Assistant/Associate Professor, University of Utah | 6/08–7/12 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Moo Eob Choi | Research Assistant Professor / Postdoctoral Fellow, University of Utah | 5/10-6/12 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Hang Goo Kim | Research Associate Professor, University of Utah | 8/08-3/11 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Chang Hun Keum  (금 창훈) | Post-Doctoral Visiting Scholar from POSCO, Pohang, Korea | 5/10-3/11 | Sulfur and nitrogen control during scrap melting in a converter |
| Georgina De Micco | Postdoctoral Visiting Fulbright Scholar from Centro Atómico Bariloche, Bariloche, Río Negro, Argentina | 6-9/10 | Chlorination reaction analysis of stable oxide minerals |
| Jae-Woo Ahn | Visiting Professor from Daejin University, Pocheon, Korea | 7/09-2/10 | Nitric acid leaching of waste plasma display panel (PDP) electrode scrap |
| Joon Pyou Park | Post-Doctoral Visiting Scholar from RIST, Pohang, Korea | 11/08-11/09 | Molybdenum refining |
| Insoo Kim | Visiting Professor from Dong-A University, Busan, Korea | 7/08-8/09 | Plasma Synthesis of Oxide Ceramic Nanomaterials |
| Jongshin Chang | Research Associate from LS-Nikko, Ulsan, Korea | 8/08-8/09 | Modeling and Improvement of the Mitsubishi Copper Smelting Lance |
| Marcelo Esquivel | Postdoctoral Visiting Scholar from Centro Atómico Bariloche, Bariloche, Río Negro, Argentina | 2004 | Chlorination reaction analysis of nuclides |
| Rafael Padilla | Visiting Professor from the University of Concepcion, Concepcion, Chile | 9/03-3/04 | Reduction of Sulfur Dioxide to Elemental Sulfur by a Cyclic Process Involving Barium Sulfide and Barium Sulfate |
| Young-Ha Hwang | Postdoctoral Visiting Researcher from Aero Technical Research Institute, Republic of Korea Air Force, Taegu, Korea | 11/01- 4/02 | Creep and Failure of Aircraft Materials |
| Bong Goo Rhee | Visiting Professor from Wonkang University, Iksan, Korea | 7/00-6/01 | Surface Treatment and Properties of Metals |
| Mitsuru Tanahashi | Postdoctoral Visiting Researcher from Nagoya University, Nagoya, Japan | 10/00-12/00 | High-Purity Copper Production |
| Jong–Il Kim | Visiting Professor from Inha Technical College, Inchon, Korea | 1/94–1/95 | Metal Recycling |
| Jun–Sik Hwang | Post-Doctoral Visiting Senior Researcher from Agency for Defense Development, Korea | 7/92–7/93 | Base Bleed Projectile Systems |
| Hwa Young Lee | Postdoctoral Associate from Korea Institute of Science and Technology | 5/91–5/92 | Synthesis of Intermetallic Compounds by Hydrogen Reduction of Chloride Melts |
| Chul–Tae Lee | Visiting Professor from Dankook University, Seoul, Korea | 7/88–7/89 | Chlorination Metallurgy |
| Joon Soo Kim | Post-Doctoral Visiting Senior Researcher from Korea Institute of Energy and Resources | 10/88–10/89 | Reduction of Rare Metal Oxides; Carbothermal Reduction of Iron in Ilmenite |
| Chang–Whan Won | Visiting Professor from Choongnam National University, Daejeon, Korea | 8/87–8/88 | Distribution of Minor Elements between Copper and Matte |
| Wangguang Wen | Research Associate from Guangzhou Research Institute of Non–Ferrous Metals, China | 12/87–5/90 | Chlorination of Low–Grade Titanium Minerals |
| Qing–he Dong | Research Associate from Hebei Institute of Mining and Metallurgy, Hebei, China | 8/84–7/86 | Extractive Metallurgy |
| Yong–Nian Xia | Research Associate from Institute of Chemical Metallurgy, Chinese Academy of Science, China | 1/83–9/87 | Extractive and Process Metallurgy |
| Shao–Xin Lu | Visiting Scholar from East–China Petroleum Institute | 5/82–7/83 | Oil Shale Processing |
| M. Shamsuddin | Visiting Professor from Banara Hindu University, India | 8/79–8/80 | Gaseous Reduction of Metal Sulfides and Solution Mining of Deep Copper Deposits |

**RESEARCH ASSOCIATES**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Status | Dates | Topic |
| Shin–min Shih | Postdoctoral Associate | 5/77–8/79 | Oil Shale Conversion |
| Rajendra Goel | Postdoctoral Associate | 9/78–4/79 | Various Extractive and Process Metallurgy |
| Hong Wen Gao | Postdoctoral Associate | 10/79–12/82 | Mathematical Modeling of the Solution Mining Process for Deep Copper Deposits |
| Zhijie Qu | Visiting U.N. Scholar from Institute of Chemical Metallurgy, Chinese Academy of Science, China | 2/84–2/85 | Flash Smelting Process |
| Hyun–deok Baek | Visiting Scholar from Korea Mining and Smelting Company, Korea | 8/84–3/85 | Copper Smelting Process |
| Jyri Juhani Talja | Post–Licentiate Research Associate from Outokumpu Company, Finland | 6/92–9/94 | Flash Smelting of Nickel |
| Leena Maria Kastehelmi Kojo | Research Associate from Outokumpu Company, Finland | 6/92–9/94 | Bath Smelting of Nickel |
| Man Seung Lee | Postdoctoral Associate | 10/93–10/94 | Dispersed–Phase Holdup in Liquid–Liquid Emulsions Formed by Bottom Gas Injection |
| Kirsi Marjeana Riihilahti | Research Associate | 8/94–2/98 | Flash Converting of Solid Copper Matte |
| Insoo Kim | Postdoctoral Associate | 4/99-9/99 | Corrosion of Refractory Linings |
| Zhijing Zhang | Postdoctoral Associate | 11/01-3/02 | Chemical Vapor Synthesis of Nano-Sized Intermetallic Powders |
| Gilsoo Han | Postdoctoral Fellow | 11/03-8/06 | Chemical Vapor Synthesis of Nano-Sized Inorganic Powders |
| Jennifer Spinti | Postdoctoral Researcher | 10/04-8/05 | Computational Fluid Dynamic Modeling of Flame Reaction Synthesis of Nanopowders |
| Young-Ugk Kim | Postdoctoral Fellow | 5/05-3/06 | Flame reaction synthesis of Nanosized WC-Co Composite powder |
| Bin Wan | Postdoctoral Fellow | 6/05-2/06 | Computational Fluid Dynamic Modeling of Flame Reaction Synthesis of Nanopowders |
| Peng Fan | Postdoctoral Fellow | 9/05-8/08 | Novel Nanocrystalline Intermetallic Coatings for Metal Alloys in Coal-Fired Environments |
| Lin Zhou | Research Associate from China Yunnan Metallurgical Group | 11/07-5/08 | Polysilicon production |
| Taegong Ryu | Postdoctoral Fellow | 06-09/08 | Inorganic Nanopowder Synthesis |
| Moo Eob Choi | Research Assistant Professor / Postdoctoral Fellow | 5/10-6/12 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Georgina De Micco | Visiting Post-Doctoral Associate from Centro Atómico Bariloche,  Argentina | 6-9/10 | Chlorination of Tungsten Oxide |
| Mohassab Yousef Mohassab-Ahmed | Post-M.S. Assistant | 5-11/11 | Vanadium Recovery from  Black Shale |
| Mohassab Yousef Mohassab-Ahmed | Postdoctoral Associate | 6/13-6/16 | Flash Ironmaking Technology |
| Miguel Olivas-Martinez | Postdoctoral Associate | 10/13-11/24/14 | Flash Ironmaking Technology |
| Yaowei Yu | Postdoctoral Associate | 11/13-1/14 | CFD for Flash Ironmaking Technology |
| Babak 'Bobby' Goshayeshi | Postdoctoral Fellow | 11/14-11/15 | CFD for Flash Ironmaking Technology |

Short-term Visiting Researchers

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Status | Dates | Topic |
| Projjal Basu | Indo–U.S. Science and Technology Postdoctoral Fellow | 9/94–12/94 | The Smelting–Reduction Process for Iron Ore |
| Dr. Yasser Momtaz Zaki Ahmed | Partner in U.S.-Egypt joint project from Central Metallurgical R&D Institute, Cairo, Egypt | 1/05-2/05 | A new process for converting SO2 to sulfur without generating secondary pollutants through reactions with CaS/CaSO4 pellets |
| Dr. Fatma Mostafa Mohamed Abd-Alla | Partner in U.S.-Egypt joint project from Central Metallurgical R&D Institute, Cairo, Egypt | 1/05-2/05 | A new process for converting SO2 to sulfur without generating secondary pollutants through reactions with CaS/CaSO4 pellets |
| Dr. Kliment Hakobyan | Partner in joint project from National Academy of Sciences, Armenia | 6/05 | New Technology for treatment of molybdenum sulfide concentrates |
| Dong Won Lee | Postdoctoral Visiting Scholar | 9/06-10/06 | Chemical Synthesis of Nanopowders |
| Mohamed Bahgat (Saddik) | Partner in U.S.-Egypt joint project from Central Metallurgical R&D Institute, Cairo, Egypt | 1/07 | Whisker growth and swelling in iron oxide pellets during reduction |
| Eduardo Junca | Visiting Pd.D. Student from University of Sao Paulo, Brazil | 4-9/13 | Reduction of Iron Oxide Minerals |

**OTHER RESEARCH ASSISTANTS**

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Status | Dates | Topic |
| James P. Dougherty | Graduate Assistant | 9/75–12/76 | Kinetics of the Reaction between Hydrogen Sulfide and Lime |
| G. Thomas Tripp | Undergraduate Assistant | 10/76–6/77 | Degradation of Shale Oil |
| Victor J. Ketcham | Undergraduate Assistant | 9/77–6/78 | Ignition of Oil Shale Beds |
| Daniel J. Bradford | Undergraduate Assistant | 7/77–1/78 | Ignition of Oil Shale Beds |
| Kent B. England | Undergraduate Assistant | 2/78–6/79 | Ignition of Oil Shale Beds |
| Ellis M. Peterson | Undergraduate Assistant | 2/78–6/78 | Ignition of Oil Shale Beds |
| Syed Z. Rizvi | Undergraduate Assistant | 2/78–4/79 | Calorimetric Measurement on Oil Shale and Decomposition Kinetics of Oil Shale Kerogen |
| Mark C. Bronson | Undergraduate Assistant | 2/78–6/80 | Dilatometric Measurements of Thermal Expansion of Oil Shale and Carbothermal Reduction of Nickel Sulfide in the Presence of Lime |
| Scott Hartman | Undergraduate Assistant | 6/78–7/79 | Ignition of Oil Shale Beds |
| Felix T. Z. Chou | Graduate Assistant | 9/78–7/80 | Calorimetric Measurements on Oil Shale |
| Yong Hyun Baik | Undergraduate Assistant | 6/82–9/83 | Oil Shale Retorting/Alumina from Coal Wastes/Laboratory Assistant |
| Edgar Alexis Herrera | Undergraduate Assistant | 7/84–12/84 | Flash Smelting Process |
| Kezhakkedath Ramunni “Uday” Udayakumar | Graduate Assistant | 9/84–9/85 | Distribution of Zinc between Copper and Matte |
| Hyun Deok Baek | Graduate Assistant | 6/86–12/87 | Combustion Synthesis of Ceramic Materials |
| Robert Hall | Combustion Center Undergraduate Research Fellow | 9/87–7/88 | Pulverized–Coal Combustion: Reduction of SO2 emission by the use of oil shale |
| Daniel H. Loveless | Undergraduate Assistant | 6/88–6/89 | Advanced Copper Smelting Process |
| Robert J. McBride | Undergraduate Assistant | 6/88–6/89 | Flash Smelting Process |
| Aijing Yin | Graduate Assistant | 4/88–6/89 | Removal of Carbonaceous Residue in Greensheet Processing for Multilayer Ceramic Modules |
| Hong Qing Tang | Visiting Scholar from Central–South Univ. of Technology, Hunan, China | 9/88–12/88 | Sulfide Flash Smelting |
| Seong–Jae Hong | Graduate Assistant | 1/89–12/89 | Greensheet Processing for Multilayer Ceramic Modules |
| Daniel H. Loveless | Graduate Assistant | 9/90–7/93 | Drop–Size Distribution in Liquid–Liquid Emulsions Formed by Bottom Gas Injection |
| Valorie Downs | Graduate Assistant | 9/90–6/94 | Combustion Synthesis of Intermetallic Compounds |
| Scott Charles Mitson | Graduate Assistant | 9/92–12/92 |  |
| Sandra Liliana Hase | Graduate Assistant | 9/92–6/93 | New Solvent Extraction Process |
| Johanna Löttiger | Research Associate | 7/94–10/94 | Oxidation Reactivity of Solid Copper Matte Particles |
| Daniel Anders Gustaf Swartling | Research Associate | 7/95–12/95 | Flash Converting of Copper Matte |
| John R. Hugens | Graduate Assistant | 5/99-12/99 | Bottom-Gas-Injected Solvent Extraction Process |
| Danny D. LaDue | M.S. Candidate | 8/99 | Structural Defects in Polycrystalline Diamond Compacts |
| David P. Harding | Undergraduate Assistant | 8/01-3/02 | Chemical Vapor Synthesis of Nano-Sized Intermetallic Powders |
| Michael Oja | Undergraduate Assistant | 8/01-3/02 | Chemical Vapor Synthesis of Nano-Sized Intermetallic Powders |
| Ali Abdullah Mousa Al-Hazemi | Graduate Assistant | 5/01-12/02 | Alternative Ironmaking |
| Sadegh Firoozi | Graduate Assistant | 1/02-12/02 | Chemical Vapor Synthesis of Nano-Sized Intermetallic Powders; FCF Boiler Accretion Buildup Investigation |
| Peng Fan | Graduate Assistant | 8/02-9/03 | Chemical Vapor Synthesis of Nano-Sized Cermet Powders |
| Dan Slane | Graduate Assistant | 8-12/03 |  |
| Olga Briceńo | Graduate Assistant | 8/03-6/08 | Combustion Synthesis of Intermetallic Compounds Using Metal Chlorides |
| Brady Butler | Undergraduate Assistant | 8/04 | Chemical Vapor Synthesis of Nano-Sized WC-Co Composite Powders |
| Joshua Ramos | High School Intern/Lab Assistant | 6/06-6/07 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Eric L. Riddle | Undergraduate Assistant | 8/06-5/08 | Intermetallic Coatings Plasma Transferred Arc |
| Joshua Ramos | Undergraduate Assistant | 6/07-8/12 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Song-Yi Han | Undergraduate Assistant | 8/08-12/08 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Xuan Xiong | Graduate Assistant | 8/08-8/09 | Hydrogen Storage Materials |
| Kanjanabha Bhattacharyya | Graduate Assistant | 1/09-3/09 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Tyler M. Bronson | M.S. Candidate | 8/09-7/10 | CFD Modeling of a Novel Suspension Ironmaking Technology |
| Brent Randall | Undergraduate Assistant | 5/10-9/11 | Characterization of magnetite ore for improved reducibility in fluidized-beds / Flash Ironmaking Technology |
| Andrew Katsohirakis | High-School Intern | 5/10-9/10 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Oliver Taggart | High-School Intern | 7/10-9/10 | Plasma Treatment of Manganese Ores |
| Tyler Helsten | Graduate Assistant | 7/10-12/10 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Tanner Mcfarlane | Undergraduate Assistant | 5/11-12/11 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Mairambek ‘Bek’ Raimzhanov | Int. Undergraduate Intern | 7-9/11 | Novel Green Ironmaking Technology by Suspension Hydrogen Reduction |
| Colton Henline | Undergraduate Assistant | 12/11-5/12 | Flash Ironmaking Technology |
| Udo Fischer | Undergraduate Assistant | 8/12-9/14 | Flash Ironmaking Technology |
| Richard Andrew Laroche | Undergraduate Assistant | 1/13-5/16 | Flash Ironmaking Technology |
| Brian Willhard | Undergraduate Assistant  (Mech. Eng.) | 5/13-5/15 | Flash Ironmaking Technology/Plasma Synthesis of Advanced Ceramic Nanopowders |
| Jing Wang | Graduate Assistant | 8-12/13 | Flash Ironmaking Technology |
| Omar Kergaye | Undergraduate Assistant | 3/14-5/16 | Flash Ironmaking Technology |
| Osama Kergaye | Undergraduate Assistant  (Computer Sci.) | 8/14-4/18 | Flash Ironmaking Technology |
| Taylor James Smith | Undergraduate Assistant | 9/14-1/15 | Flash Ironmaking Technology |
| Abdussalam El-Gerwi | Laboratory Assistant | 12/14-8/15 | Flash Ironmaking Technology |
| Tuvshinbat ‘Tuvshu’ Ganbat | Undergraduate Assistant | 3/15-5/16 | Flash Ironmaking Technology |
| Caio Ferreira de Melo (Caio Melo) | Undergraduate Assistant | 5/15-12/15 | Flash Ironmaking Technology |
| Jacqueline de Oliveira Cota | Undergraduate Summer Intern | 3-8/15 | Flash Ironmaking Technology |
| Alexandros Koloveas | Undergraduate Assistant  (Chem. Eng.) | 9/15-5/16 | Plasma Synthesis of Advanced Ceramic Nanopowders |
| Brian Willhard | Graduate Assistant | 5/15-12/15 | Plasma Synthesis of Advanced Ceramic Nanopowders |
| Avery Smith | Undergraduate Assistant  (Chem. Eng.) | 11/15-5/16 | Flash Ironmaking Technology |
| Kendall Webb | Undergraduate Assistant  (Chem. Eng.) | 12/15-5/17 | Flash Ironmaking Technology |
| Silvia Eugenia Perez-Fontes | Ph.D. candidate | 1/07-8/15 | CFD Modeling of a Flash Ironmaking Technology |
| Alexander Hesketh | Undergraduate Assistant | 5/16-4/18 | Flash Ironmaking Technology |
| Andrew Stropkai | Undergraduate Assistant (Chem. Eng.) | 6/16-5/17 | Plasma Synthesis of Advanced Ceramic Nanopowders |
| Eman Wahbah | Ph.D. student | 1/16-7/16 | Plasma Synthesis of Advanced Ceramic Nanopowders |
| Damdin "Dom" Munkhbold | Undergraduate Assistant | 5/17-4/18 | Flash Ironmaking Technology |
| Bailey Tibbett | Undergraduate Assistant (Chem. Eng.) | 8/28/17-4/30/18 | Plasma Synthesis of Advanced Ceramic Nanopowders |
| Patrick S. Nelson | Undergraduate Assistant (Chem. Eng.) | 8/30/17-6/18 | Refractory Behavior under the Conditions of Flash Ironmaking |
| Collin T. Andersen | Ph.D. Student | 3/23-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Olivia Dale | Ph.D. Student | 5/23-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Christian Norman | Undergraduate Assistant | 3/23-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Cole D. Walker | Undergraduate Assistant  (Mater. Sci. & Eng,) | 3/23-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Jason D. Sheets | Undergraduate Assistant | 9/12- | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Olivia N. Slane | Undergraduate Assistant (Chem. Eng.) | 9/12-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Talon J. Townsend | Undergraduate Assistant  (Chem. Eng.) | 9/12-12/23 | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |
| Juliana Ortiz Castillo | Undergraduate Assistant  (Chem. Eng.) | 9/12- | NASA Big Idea Challenge 2023 “Production of Steel from Lunar Regolith through Carbonyl Iron Refining (CIR),” |

**DEGREE SUPERVISORY COMMITTEE SERVICE**

(Other than Degrees Directed)

1. June–Gunn Lee Ph.D. Materials Science & Engineering, 1976
2. Mohammad Siddique M.S. Metallurgy, 1977
3. Bryant C. Bechtold Ph.D. Materials Science & Engineering, 1978
4. Chang Soo Kim M.S. Fuels Engineering, 1978
5. Elcio Fabio S. Pereira Ph.D. Metallurgy, 1978
6. Jaime E. Sepulveda Ph.D. Metallurgy, 1979
7. Kyung Sup Chung Ph.D. Fuels Engineering, 1979
8. Muthiah Ramanathan M. S. Fuels Engineering, 1979
9. Scott David Lewis M.S. Materials Science & Engineering, 1979
10. David James Kinneberg M.S. Metallurgy, 1980
11. Dong Ghie Chae Ph.D. Metallurgy, 1980
12. Ramana Guda Reddy Ph.D. Metallurgy, 1980
13. Hsiang–Yun Arthur Kung Ph.D. Fuels Engineering, 1980
14. Hun–Joon Sohn Ph.D. Metallurgy, 1980
15. Kwang Eun Chung Ph.D. Fuels Engineering, 1980
16. R. Ramachandran Ph.D. Fuels Engineering, 1980
17. Seong–Yang Han Ph.D. Metallurgy
18. Dale B. Hoggard M.S. Materials Science & Engineering, 1981
19. Rolf J. Wesley Ph.D. Metallurgy, 1981
20. Asanee Chantong Ph.D. Fuels Engineering, 1982
21. Osvaldo Bascur Ph.D. Metallurgy, 1982
22. William Theodore Pate M.S. Metallurgy, 1982
23. Chang Soo Kim Ph.D. Fuels Engineering, 1983
24. Ralph Wilhelm Pensel M.S. Mechanical Engineering, 1983
25. Thomas Cable M.S./Ph.D. Fuels Engineering, 1983
26. Brett Waterman M.S. Metallurgy, 1984
27. Ienwhei Edward Chen Ph.D. Fuels Engineering, 1984
28. John Shigley M.S./Ph.D. Fuels Engineering, 1984
29. Ximeng Zhu Ph.D. Metallurgy, 1984
30. Kurn Cho Ph.D. Metallurgy, 1986
31. Jong–Heon Ahn Ph.D. Metallurgy, 1988
32. Liang–Ching Lin Ph.D. Fuels Engineering, 1988
33. Whungwhoe Kim Ph.D. Metallurgy, 1988
34. Bradley C. Paul Ph.D. Mining Engineering, 1989
35. Qiu–Jiang Lu Ph.D. Meteorology, 1989
36. Federico Calisaya M.E. Metallurgy, 1990
37. Kenneth S. Gritton Ph.D. Chemical Engineering, 1991
38. Eric Eddings Ph.D. Chemical Engineering, 1992
39. Jhi–Yong Kim Ph.D. Metallurgy, 1992
40. Joon–Hyeoung Jang Ph.D. Metallurgy, 1992
41. Lawrence A. Neer Ph.D. Chemical Engineering, 1992
42. Qiuping Yang Ph.D. Fuels Engineering, 1993
43. Shardul Agrawala M.S. Metallurgical Engineering, 1993
44. Zhaoyi Yang Ph.D. Fuels Engineering, 1993
45. Robert Gene Barton Ph.D. Chemical Engineering, 1994
46. Marzena Wisniewska M.S. Meteorology, 1995
47. Ju Woung Yoon M.S. Chemical Engineering, 1995
48. Nagjoon Choi Ph.D. Metallurgical Engineering, 1996
49. Polycarpe Songfack Ph.D. Metallurgical Engineering, 1996
50. Sam Asihene Ph.D. Metallurgical Engineering
51. Rao Annapragada Ph.D. Chemical and Fuels Engineering
52. Amlan Datta Ph.D. Metallurgical Engineering, 1998
53. Luis A. C. Klujszo Ph.D. Metallurgical Engineering, 1998
54. Ramesh Venugopal M.S. Metallurgical Engineering, 1998
55. Kyongjun An Ph.D. Metallurgical Engineering, 1998
56. John Pratt Ph.D. Chemical and Fuels Engineering
57. Gilsoo Han Ph.D. Metallurgical Engineering, 2003
58. Wanlin Wang M.S. Metallurgical Engineering, 2003
59. Kyeongseok Oh Ph.D. Chemical and Fuels Engineering, 2004
60. Wensheng Wang Ph.D. Materials Science & Engineering, 2004
61. Amol Diwakar Joshi M.S. Metallurgical Engineering, 2004
62. Hyungtae Lim M.S. Materials Science & Engineering, 2005
63. Feng Zhao Ph.D. Materials Science & Engineering, 2005
64. Byung Sang Choi Ph.D. Metallurgical Engineering, 2005
65. Jose A. Delgadillo Ph.D. Metallurgical Engineering, 2005
66. Yong Han Ph.D. Materials Science & Engineering, 2006
67. Ravindra Bhide Ph.D. Metallurgical Engineering, 2007
68. Nikit Phadke M.S. Metallurgical Engineering, 2008
69. Aphi Rodchanarowan Ph.D. Metallurgical Engineering, 2008
70. Hyungtae Lim Ph.D. Materials Science & Engineering, 2009
71. Prashant Kumar Sarswat M.S. Metallurgical Engineering, 2009
72. Vineet Kumar Ph.D. Metallurgical Engineering, 2010
73. Hongtao Wang Ph.D. Metallurgical Engineering, 2010
74. Jun Guo Ph.D. Metallurgical Engineering, 2011
75. Pankaj Tiwari Ph.D. Chemical Engineering, 2012
76. Prashant Kumar Sarswat Ph.D. Metallurgical Engineering, 2012
77. Yakun Zhu M.S. Metallurgical Engineering, 2012
78. Asad Hasan Sahir Ph.D. Chemical Engineering, 2013
79. Sadegh Safarzedeh Ph.D. Metallurgical Engineering, 2013
80. Christopher Clayton Ph.D. Chemical Engineering, 2013
81. Keith Gneshin Ph.D. Chemical Engineering, 2013
82. Palash Panja Ph.D. Chemical Engineering, 2014
83. Matthew A. Hamilton Ph.D. Chemical Engineering, 2018(?)
84. Chengshang Zhou Ph.D. Metallurgical Engineering, 2015
85. Lei Zhang Ph.D. Materials Science & Engineering, 2015
86. Yakun Zhu Ph.D. Metallurgical Engineering, 2015
87. Devin Rappleye Ph.D. Metallurgical Engineering, 2016
88. Parker Okabe Ph.D. Nuclear Engineering, 2020
89. Camilo Corredor Ph.D. Chemical Engineering, 2018
90. Hyrum Lefler Ph.D. Metallurgical Engineering, 2018
91. Kyle O'Malley Ph.D. Chemical Engineering,
92. Jun Du Ph.D. Metallurgical Engineering, 2020
93. Haruka Pinegar Ph.D. Metallurgical Engineering, 2020
94. Rajashekhar Marthi Ph.D. Metallurgical Engineering, 2021
95. David Ethan Hamilton M.S. Metallurgical Engineering, 2021
96. Jarom Chamberlain  Ph.D. Metallurgical Engineering,
97. Peilin Yang M.S. Metallurgical Engineering, 2022
98. Joel K. Ilunga M.S. Metallurgical Engineering, 2022
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