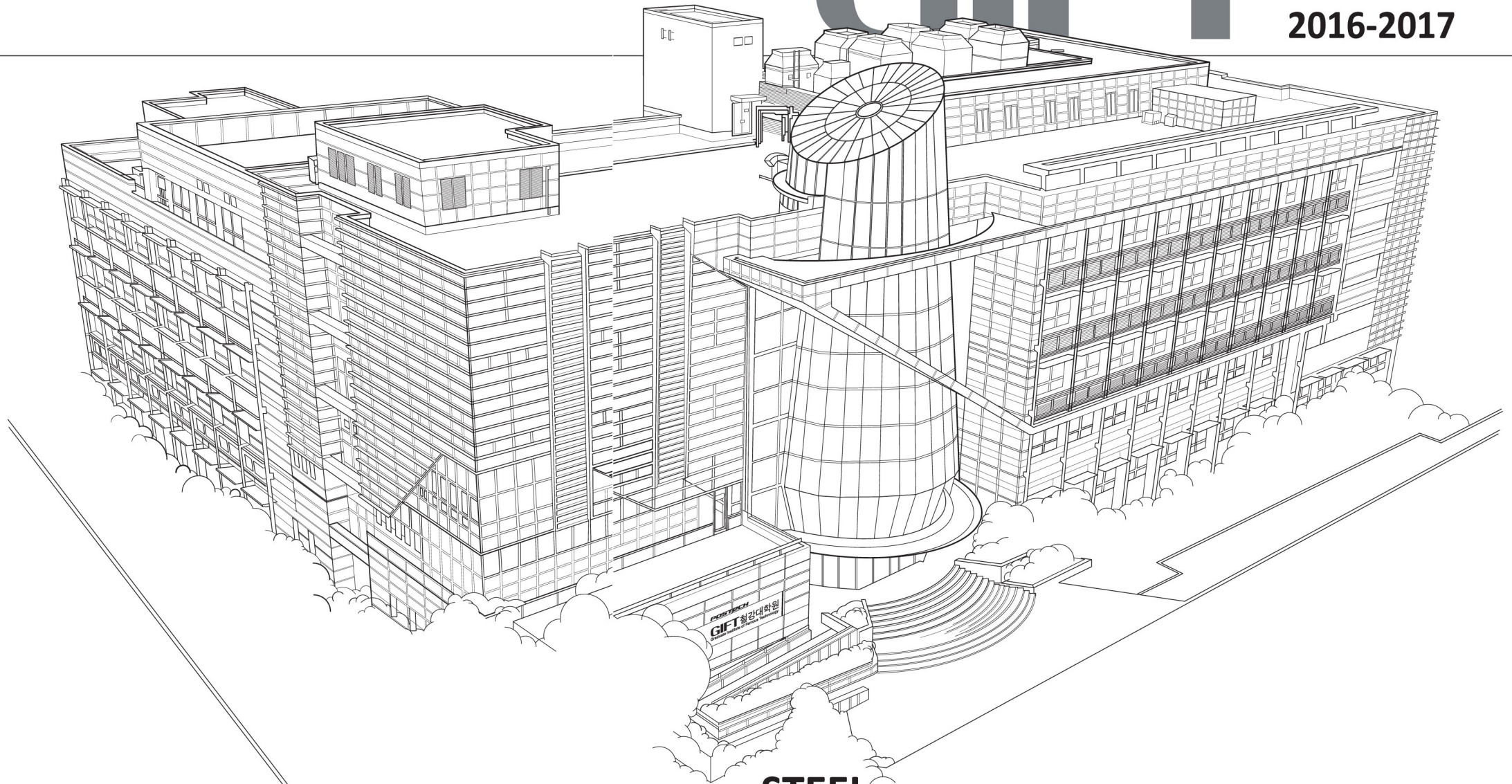


**POSTECH**

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**2016-2017**



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**GIFT**

GRADUATE INSTITUTE OF FERROUS TECHNOLOGY  
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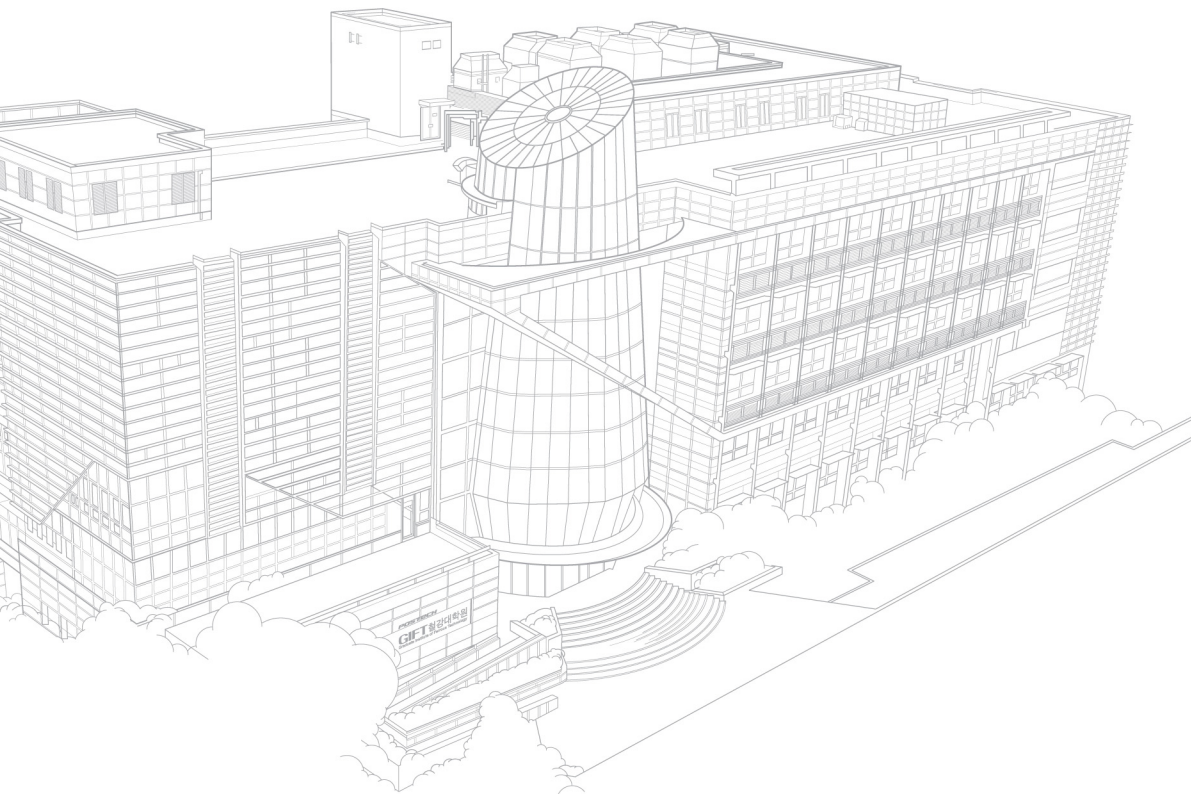
🌐 <http://gift.postech.ac.kr>

**STEEL,  
THE EVER-EVOLVING MATERIAL**

# Graduate Institute of Ferrous Technology

## CONTENTS

4	Introduction
5	Mission & Vision
6	Welcome from the Dean
8	History
10	Research Organization
12	<b>Green &amp; Clean Technology Center</b>
14	- EML
16	- CSL
18	- CTL
20	<b>Materials Development Center</b>
22	- ATL
24	- MCL
26	- MDL
28	- SSL
30	<b>Application &amp; Solution Center</b>
32	- CML
34	- MML
36	- MRL
38	Academics
42	How to Apply
44	입시 요강
46	Internship Program
47	Postechian Participation
48	People
64	Students' Life
66	How to get to GIFT at POSTECH
67	Campus map





# Introduction

Founded in 2005, The Graduate Institute of Ferrous Technology (GIFT) is the world's only fully accredited institute of higher learning offering graduate education in the field of steel science and technology.

The unique educational focus of the Graduate Institute of Ferrous Technology was dictated by the compelling societal need for highly educated professionals with advanced skills in the field of steel science and technology.

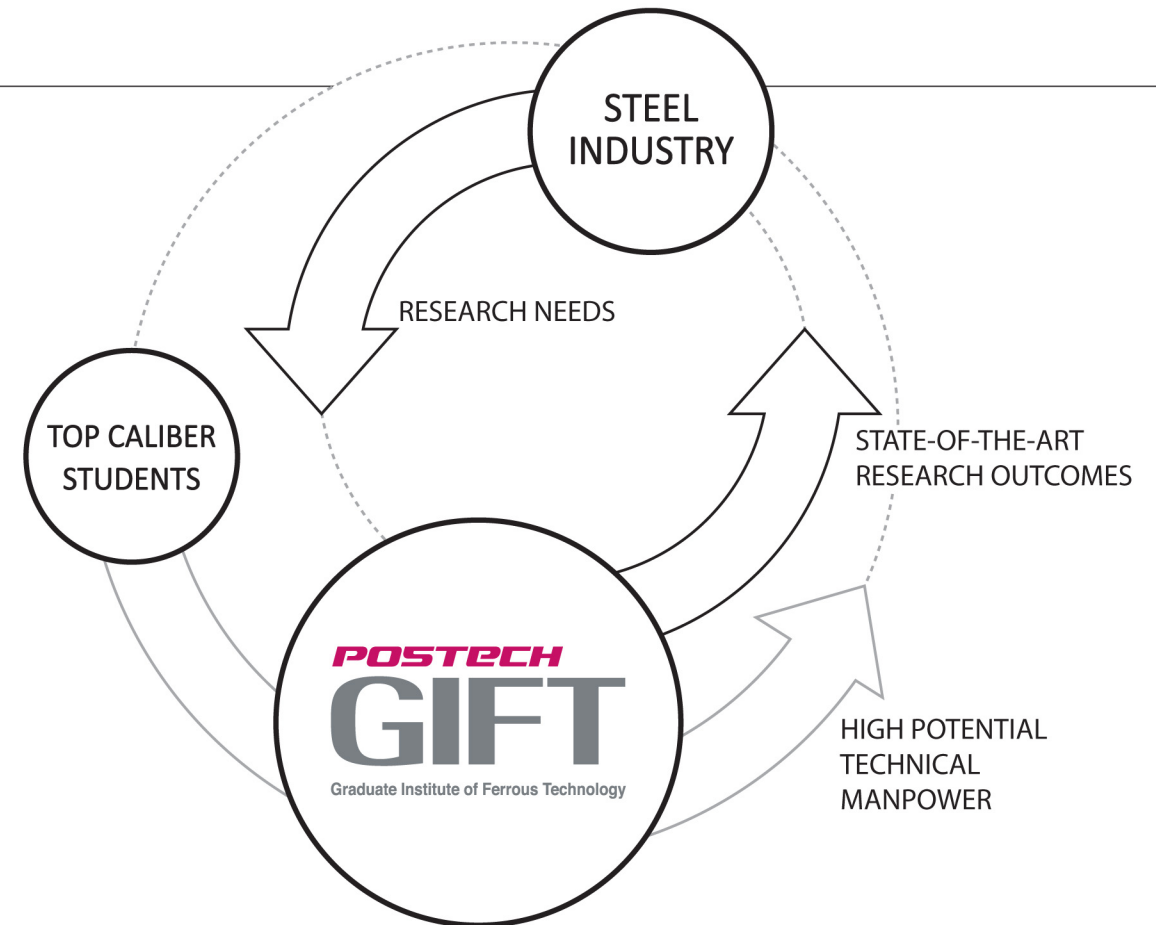
Since its foundation, GIFT has become the official acronym for the Graduate Institute of Ferrous Technology. The mission of the GIFT academic program is to develop in its students a spirit of scientific inquiry and technological innovation coupled to scholarly excellence.

GIFT is committed to the highest academic standards in education in the field of steel science and technology, consistent with the tradition of advanced research at the Pohang University of Science and Technology.

The GIFT academic program is designed to expand fundamental knowledge and enable the creation of new technologies in the field of steel science and technology through teaching and creative research.

GIFT also aims to contribute to the national and international economic development as well as human resource development through cooperation with industries associated with the production and application of advanced iron and steel technologies.

# Mission & Vision



The Graduate Institute of Ferrous Technology was established with a mission to grow into a world leader in education and research specializing in advanced iron and steel technology. GIFT aims to educate future leaders in iron and steel technology, and lead the field in innovation, creativity, and foresight. GIFT intends to contribute to national and international economic development through a close cooperation with industries associated with iron and steel production, and the application of ferrous alloys.

# Welcome from the Dean

## Creating New Values by Industry-Academy Cooperation

Steel is so widely used in our daily lives that it is hard to find a single place where it is not used. This ubiquity is due to the abundance of iron, the excellent characteristics of steel, and its high recycling rate. No other materials, even newly-developed ones, can yet replace steel. So steel will continue to be the major material in most industries. To keep its dominating position, steel must be persistently proved to be the most economical and excellent material, and its production should meet the demands of highly-advanced industries while being produced in the most environmentally benign method possible. Therefore, research must be conducted on the basics of steel production, and on technologies that can be deployed commercially.

To serve these needs, the research-oriented Graduate Institute of Ferrous Technology was established in 2005 after 10 years of preparation. GIFT's missions are to nurture the best manpower who will lead the future steel industry, and to develop innovative technologies in new processes and new materials by which the competitiveness of steels can be achieved. As the result of its efforts, GIFT has graduated about 100 Ph.Ds. and about 200 M.Ss., and its researchers have published more than 1000 journal articles. GIFT has accomplished excellent research results such as developing ultra-strong low-density steel using FeAl-type intermetallic compounds, which was spotlighted in 2015. To improve our results, GIFT will actively develop projects in accordance with the current trends of the steel industry and with the demands of the steel market.



GIFT has close links with many major steel producers including POSCO, by which GIFT is fully funded. Thus, GIFT is at the center of the best research environment, and can maintain close ties to steel producers and users on a global basis, by engaging in activities such as collaborative projects, workshops, and scientist exchanges. With these efforts, GIFT will become a global leader of developing ferrous technologies, and remain a step ahead of its competition.

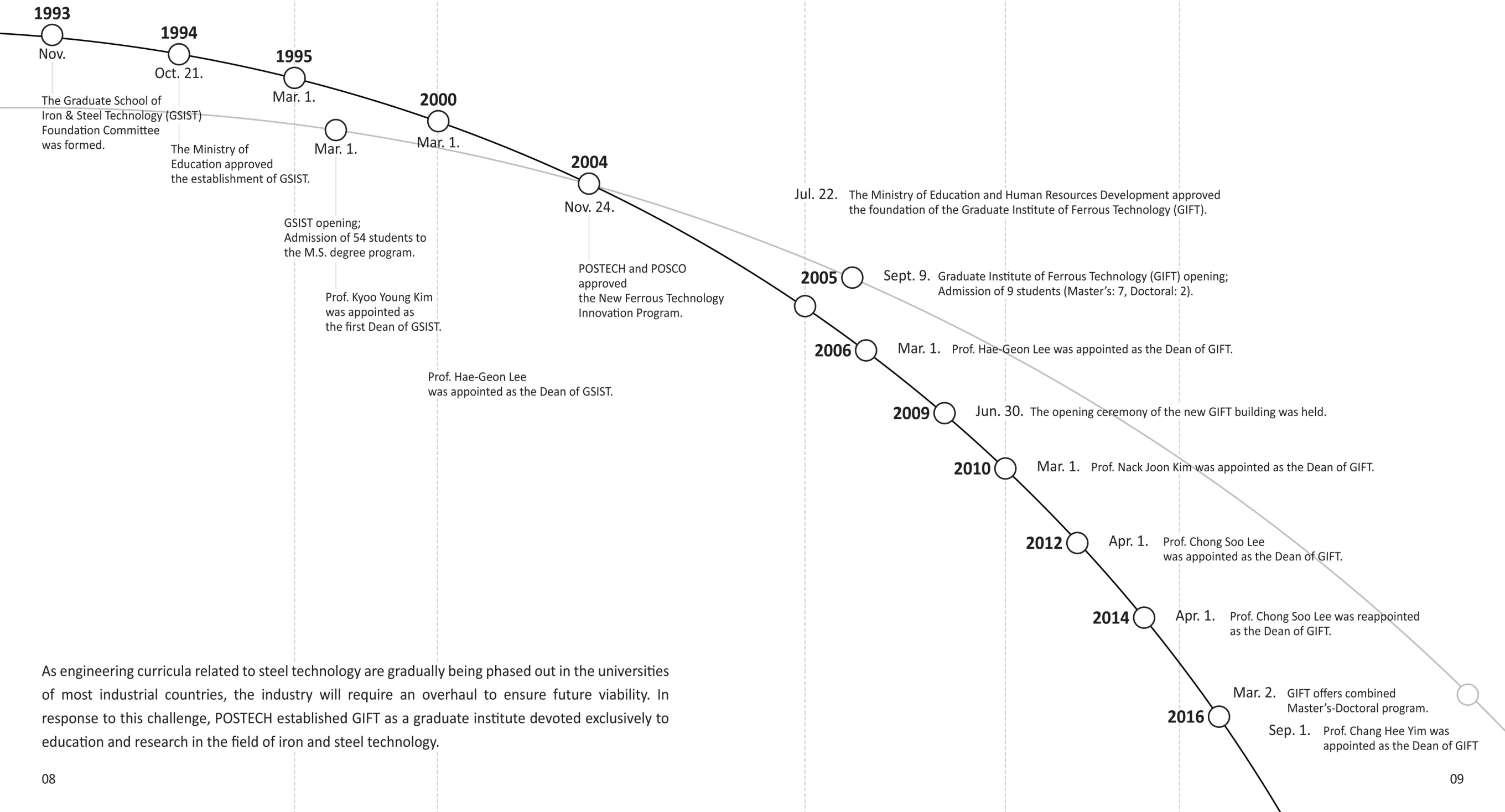
GIFT, as the "Steel Academy of Excellence", will continue to do its utmost to create new value by fostering the best manpower and continuing to develop industry-academia cooperation.

*Chang Hee Yim*

Chang Hee Yim  
Dean & Professor  
GIFT, POSTECH



# History



As engineering curricula related to steel technology are gradually being phased out in the universities of most industrial countries, the industry will require an overhaul to ensure future viability. In response to this challenge, POSTECH established GIFT as a graduate institute devoted exclusively to education and research in the field of iron and steel technology.

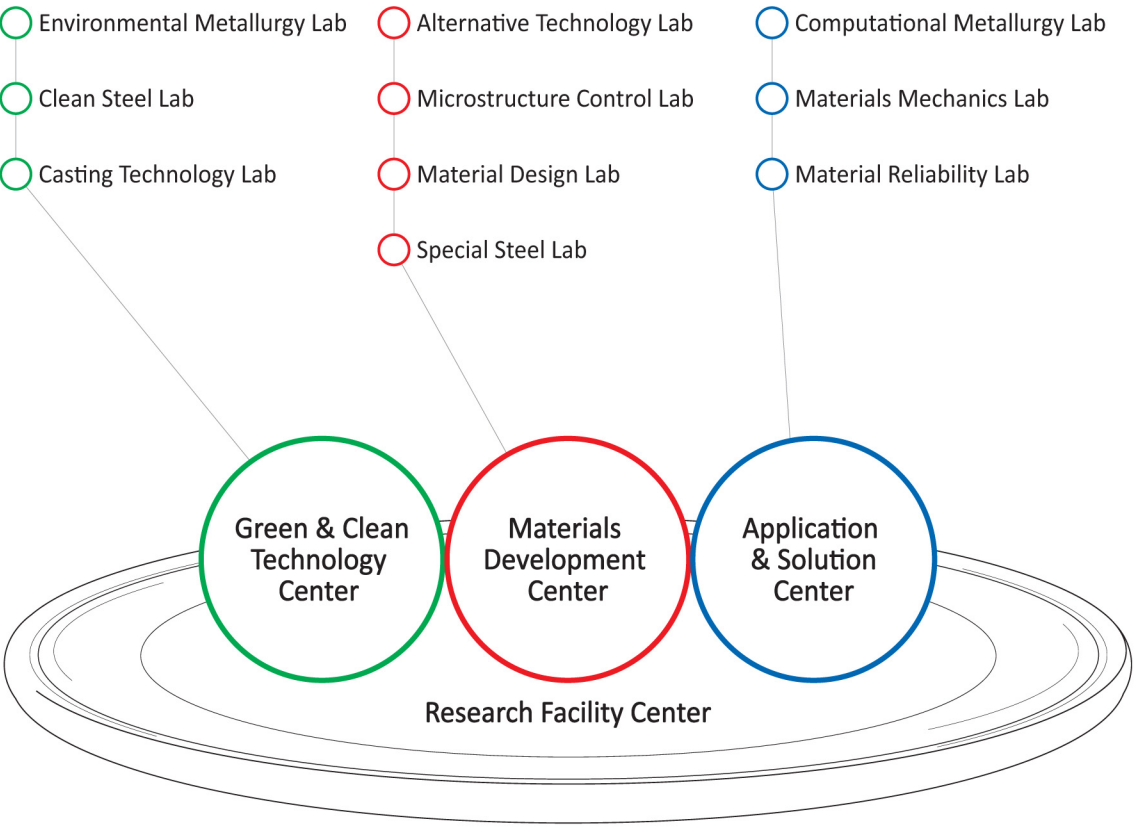
# Research Organization

## 10 Laboratories in 3 Centers

GIFT tries to cover all the aspects encompassing steel science and technologies from the extractive metallurgy to the final steel products. It is composed of 3 research centers of similar research fields to enhance collaborative research work and create a significant synergy effect between the laboratories. A total of 10 research laboratories belong to the 3 research centers as shown in the table below. In addition, 1 Research Facility Center has been established to support research works. Each laboratory focusing on a particular aspect of steel metallurgy is generally staffed by professors, research professors and post-doctoral researchers and graduate students.

CENTER	DIRECTOR	R&D AREA	LABORATORY
Green & Clean Technology Center	Iron- & Steel-Making	Sung-Mo Jung	EML, CSL, CTL
Materials Development Center	Materials Development	Sung-Joon Kim	ATL, MCL, MDL, SSL
Application & Solution Center	Products	Frédéric Barlat	CML, MML, MRL,
Research Facility Center	Facility Support	Dong Woo Suh	-

The core funding of GIFT covers all these activities and other projects will be sought on an ad hoc basis. This will be by far the most intensive steel activity in the world, led by world famous professors working in an interdisciplinary environment.





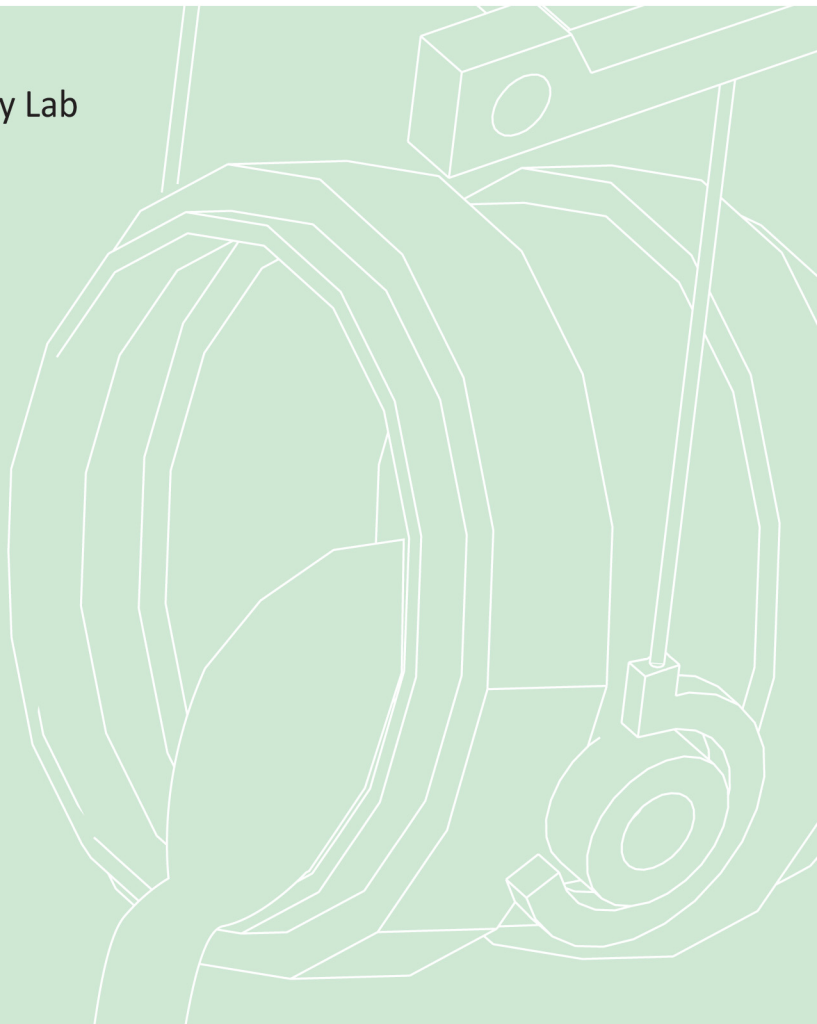


## Green & Clean Technology Center

○ Environmental Metallurgy Lab

○ Clean Steel Lab

○ Casting Technology Lab



## Green & Clean Technology Center

Director: Sung-Mo Jung

Nowadays, in the steel industry, the most important spoken key words are “environmental protection” and “high quality clean steel production”. Therefore R&D innovation is essential to strengthening international competitiveness of the steel product whole embracing these issues.

The ultimate goals of the Green & Clean Technology Center are

- 1) To develop innovative iron-making processes using low grade ores and coals with less pollution materials and CO<sub>2</sub> emission
- 2) To develop future-oriented technologies for clean steel-making, refining and solidification
- 3) To develop leading edge process control and automation technologies for low cost and high productivity

The major research areas are

- 1) High temperature thermochemistry
- 2) Physicochemical properties/reaction kinetics
- 3) Heat and fluid flow dynamics
- 4) Coal and coke technology
- 5) Advanced agglomerate manufacturing technology
- 6) CO<sub>2</sub> sequestration technology
- 7) Steel process control and automation





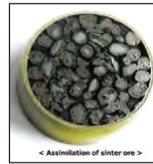
EML seeks for (1) excellence in the world, (2) international global network development, and (3) collaboration with industry. EML focuses on the in-depth understanding of the phenomena in ironmaking processes to meet the demand of environmental issues (resources, energy and CO<sub>2</sub> issues), and apply them to industrial applications.

Our mission is to develop innovative technologies in conventional and alternative ironmaking processes. That is, the development of environmentally conscious processes for steel production, waste materials and heat treatment processes and new resource development with minimum energy and CO<sub>2</sub> emission. To develop the new processes, experiments as well as computational simulation (CFD, DEM, and PFM) are extensively carried out.

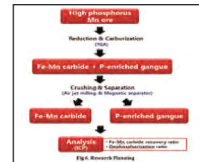
## RESEARCH AREAS

### ADVANCED AGGLOMERATE MANUFACTURING TECHNOLOGY

Due to the depletion of high grade iron ore resources, we are forced to use low grade ore or never-used ore while maintaining the physical and chemical properties of current sinter ore. For the development of such technology, it is important to understand the details of the melting and assimilation behavior during the sintering process as well as physical chemistry of sintering process. Since control of quasi particle structure is known as an effective method of improving sinter quality and productivity, both minimization of detrimental properties and maximization of beneficial characteristics of various iron ores can be achieved by designing an optimum quasi particle structure. To effectively produce high quality iron ore from unfavorable iron ore (i.e. magnetite), fundamental research on the microstructure formation was investigated (presented in ICSTI 2012). Now, the optimum quasi-particle structure has been investigated based on melting and assimilation behaviors of magnetite ore.



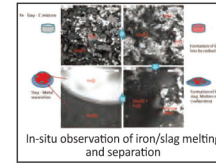
### DEPHOSPHORIZATION TECHNOLOGY



New generation advanced high-strength steels (AHSS) such as TWIP steel containing high manganese content have been developed. The removal of impurities from manganese alloys is of great importance because manganese content in steel has been increased. One of the principle impurities in manganese ores is phosphorus. This is of critical concern since most of the phosphorus enters the alloy in the smelting process rather than entering the slag. EML proposed an alternative method of removing phosphorus through carbide formation. As phosphorus solubility in carbide is thought to be negligibly small, the removal of phosphorus from iron manganese carbide can be achieved by magnetic separation.

### ALTERNATIVE IRONMAKING TECHNOLOGY FOR UTILIZATION OF LOW GRADE RESOURCES

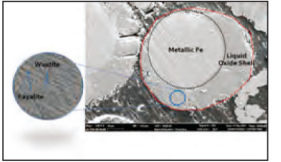
To cope with the rising cost of iron ore and the depletion of high quality ore, extensive utilization of low grade iron ore such as high Al<sub>2</sub>O<sub>3</sub> ore or fine ore is required. Direct reduction of carbon composite iron ore by rotary hearth furnace is one feasible method to deal with those fine ores.



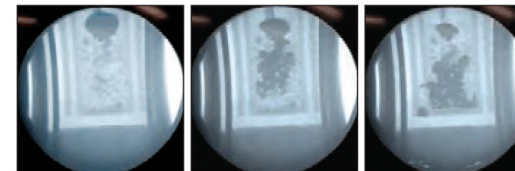
However, the slag composition is generally fixed in the BF slag region where the slag basicity is 1~1.2 because of slag melting temperature. Thus, the use of high Al<sub>2</sub>O<sub>3</sub> ore is very restricted. To utilize high-Al<sub>2</sub>O<sub>3</sub>-containing fine ores, the slag system of high basicity, low melting temperature and low viscosity is being considered at this project. The behaviors of iron melting by solid carbon and wetting/separation phenomenon between slag, iron and carbon at elevated temperatures have been studied by confocal laser scanning microscopy. Also, this project aims to optimize reduction of highly fluxed CCA to produce high purity solid pig iron.

### EFFECTIVE USE OF METHANE AS A REDUCING AND CARBURIZATION GAS

Methane is unstable and easily decomposes into carbon and hydrogen above 823K. [CH<sub>4</sub> > C(gr) + 2H<sub>2</sub>] Therefore, carbon activity in the methane-containing gas can be above unity (graphite) at the appropriate CH<sub>4</sub>/H<sub>2</sub> ratio and temperature. Accordingly, methane can provide favorable thermodynamic conditions for reduction, suggesting a very high possibility as a reducing agent in iron-making processes. Nevertheless, most gas-based DRI processes (Fluidized bed, Midrex, HyL, etc.) do not use CH<sub>4</sub> directly as a reducing agent but only use it to produce CO and H<sub>2</sub> by reforming reaction as follows: [CH<sub>4</sub> + CO<sub>2</sub> > 2CO + 2H<sub>2</sub>] This study investigates the reduction and carburization features of fine iron ores in the CH<sub>4</sub> containing gas. In addition, it shows the feasibility of CH<sub>4</sub> as a direct reducing agent in the DRI processes.



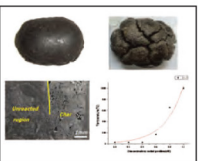
### METAL & SLAG FLOWING TECHNOLOGY



Permeability of metal and slag in the lower part of blast furnace and smelter is strongly affected by the size of coke bed and the viscosities of metal and slag, chemical composition and surface tension. Among them, the surface tension is the main factor determining the metal/slag hold-up in the small coke bed. To enhance the metal/slag permeability in the coke bed, the effect of surface tension of metal/slag on their flow behaviors should be understood. By irrigating molten metal and slag through the coke bed under X-ray in-situ observation, the effect of surface tension was well explained. This project has shown that lowering the surface tension highly enhanced the metal/slag permeability (Prepared for the publication). Other research programs related in this field are: (1) multiphase simulation of discrete metal/slag flow, (2) water models of different contact angles in glass bed.

### METAL & SLAG FLOWING TECHNOLOGY

Coal briquettes are used for the smelting process in the FINEX process. They must have high strength at high temperature and rapid heating condition as well as at room temperature. If the strength is not enough to maintain their shape, the fragmented coal briquettes may impair the gas permeability in the melter-gasifier. The main reason for the breakage of coal briquette is rapid generation of volatile matter from coal. The generated volatile matter causes pressure increases inside the briquette. Therefore, cracks are initiated from the surface area. The study of these phenomena is very valuable for reducing the crack initiation and propagation by increasing the strength of coal briquettes.



For further information, please visit <http://eml.postech.ac.kr/>





The word, “cleanliness” is a vitally important keyword in materials science and technology, as “cleaning” is the first and essential step in making the most of unique properties of a material of interest. It is imperative that the steel must be in the best state of ‘cleanliness’ when steel is to be developed, innovated or created for a particular objective. The control of steel cleanliness requires in-depth knowledge in thermodynamics, reaction kinetics and fluid dynamics.

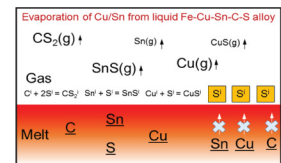
The mission of CSL, the Clean Steel Laboratory, is to develop process technologies which enable to meet requirements for innovating steels in use and for creating new steels for the future. It focuses mainly on high temperature physicochemical interactions occurring at various steps of steel production.

CSL provides its MS and PhD students with a rigorous scientific and technical training through hands-on experience and intensive discussion. They are led to developing a sense of innovation and creation.

CSL has expertise in steel production technologies, both practical processing and process simulation, with a special emphasis on steelmaking, refining and casting.

## RESEARCH AREAS

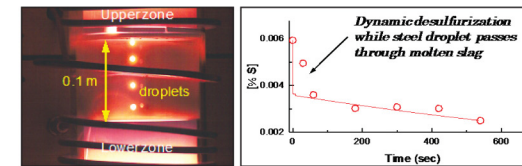
### RECYCLING OF FERROUS SCRAP FOR SUSTAINABLE STEEL PRODUCTION



Ferrous scrap after its life for the use of steel product such as car, construction suppliers, etc. has been accumulating for many years, while high quality iron ore is now limited. It is one of critical future issues to be resolved that ferrous scrap should be economically utilized. This ensures recycling of limited resources available to us, and contributes to the eco-friendly ironmaking and steelmaking process. It has been a challenging task to remove a number of tramp elements in steel scrap such as copper, tin, zinc, etc. within a reasonable process time and by a reasonable process cost. In our research laboratory, reaction mechanism of the evaporation of these tramp elements has been investigated via high temperature gas-liquid experiment, and in-depth kinetic analysis. Thermodynamics of liquid alloys containing these tramp elements has been also investigated via high temperature experiment coupled with CALPHAD thermodynamics. By doing this, effective evaporation process is to be designed.



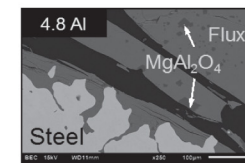
### DEVELOPMENT OF STEEL REFINING / CASTING PROCESS FOR CLEAN STEEL PRODUCTION



In order to cope with rigorous demand from steel customers, it is indispensable to control quality of steel during refining and casting processes. New idea about the refining process employing steel droplets has been investigated which may be realized in near future.

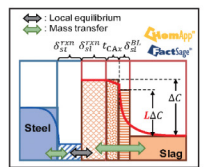
Clogging of submerged entry nozzle for continuous casting process has been also actively investigated in collaboration with plant experts.

### DEVELOPMENT OF PROCESS CONDITIONS FOR HIGH ALLOYED STEEL - High Al steel



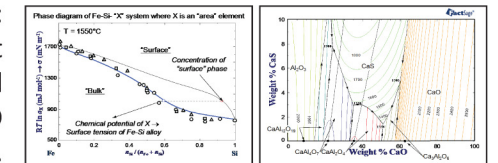
One of future steel applications is utilizing low density - high strength steel, and one of candidates is high Al steel. Its superiority regarding physical properties is now more or less visible, however, its commercial production is still not foreseeable due to its aggressive character by high Al content. Continuous casting is difficult at present due to strong interaction between Al and mold flux. In our research

laboratory, we have investigated the reaction mechanism between molten steel of high Al and mold flux based on calcium silicate. By employing high temperature experiment, CALPHAD thermodynamic modeling, and reaction kinetic analysis, evolution of mold flux chemistry can be simulated. This can also be used to design a stable mold flux which is to be inert to the aggressive Al in liquid steel.



### DEVELOPMENT OF STEEL REFINING / CASTING PROCESS FOR CLEAN STEEL PRODUCTION

We have been actively using CALPHAD thermodynamics: developing thermodynamic databases for multi-component steel/alloy/slag/inclusion, which is now a part of commercial CALPHAD software, FactSage. Using the CALPHAD thermodynamics, reaction kinetic calculations are assisted.



Moreover, one of important physico-chemical properties such as surface tension can be calculated using the CALPHAD thermodynamics, and efficient calculation method has been developed.

For further information, please visit <https://sites.google.com/site/cslgiftpostech/>





### NEW FRONTIER in SOLIDIFICATION AND CASTING

Liquid steel with satisfactory cleanliness eventually need to be cast. A number of metallurgical phenomena occurs during casting process, which critically influence the quality of cast products. These include micro- and macro-segregation of elements due to uneven distribution between liquid and solid phases, morphological evolution of solidification structure followed by dendritic growth of the solid front, formation and evolution of inclusions and precipitates. The surface quality of the cast is also strongly influenced by the mold flux which governs the lubrication and heat transfer in a continuous casting mold.

The Casting Technology Lab (CTL) focuses on structure and properties of both the steel and non-metallic materials during continuous casting process. Especially, we aim to clarify the important but uncertain behavior of steel and slag during initial stage of casting process such as the origin of irregular growth of steel shell, occurrence of sub-surface crack from the solidification front, kinetics of melt crystallization of mold fluxes. Based on better understanding on principal of solidification and casting, we will continuously enhance both the castability and quality of various innovative steel grades such as high alloyed AHSS (Advanced High Strength Steel), UHSS (Ultra High Strength Steel), and low density steel. At the same time, we will also pursue the alternative and innovative casting technology, for example, exceptionally high speed solidification process by laser metal deposition and strip casting.

### RESEARCH AREAS

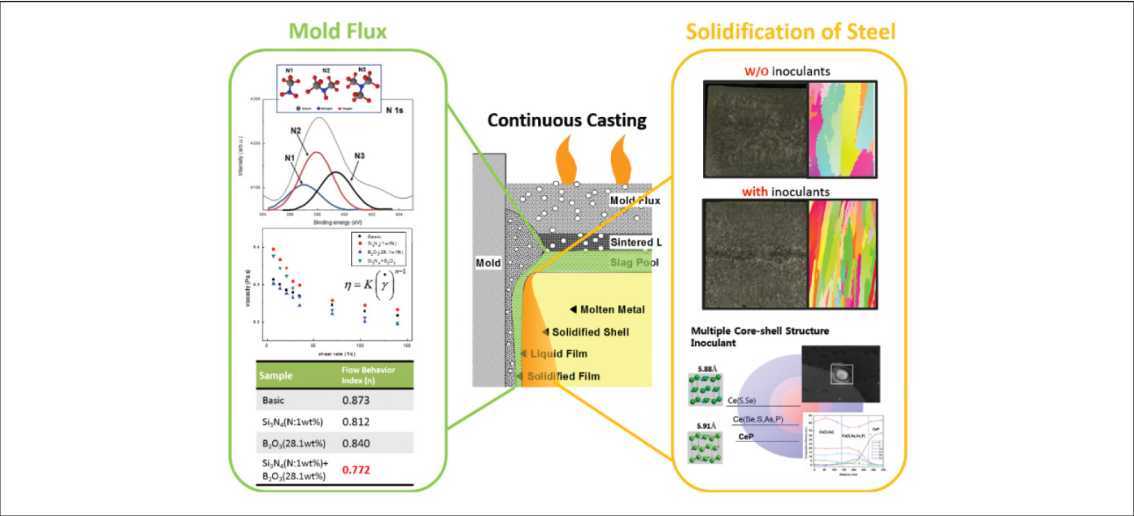
- Measurement of Physical Properties
- Structure Analysis of Steelmaking and Casting Slags
  - Viscoelasticity (Shear Thinning) of Mold Fluxes
  - Mie Scattering Behavior Induced by Metallic Particles in the Slag Film

### Modeling of Metallurgical Phenomena

- Mold Heat Transfer and Lubrication considering Rheology of Slag Film
- Modeling of Interfacial Behavior between Slag and Molten Steel
- Solidification of Steel Shell during Initial Stage of Casting Process

### Innovation of Continuous Casting Process

- Inoculants Feeding Technology into Continuous Casting Mold
- Noble Technology for Grain Refinement of Continuously Cast Slab
- Prevention of Sub-surface Cracks on a Cast Slab
- Application of Oxide Metallurgy into 3-D Printing Process



For further information, please visit <http://ctlab.postech.ac.kr>







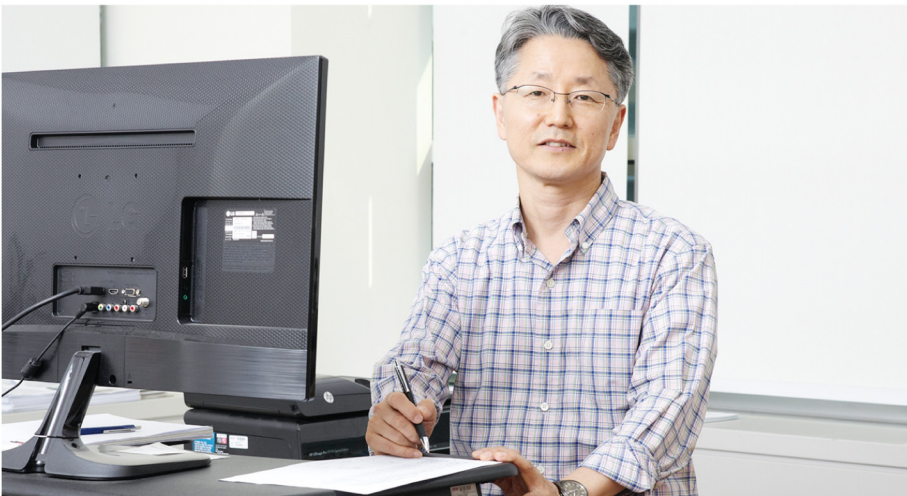
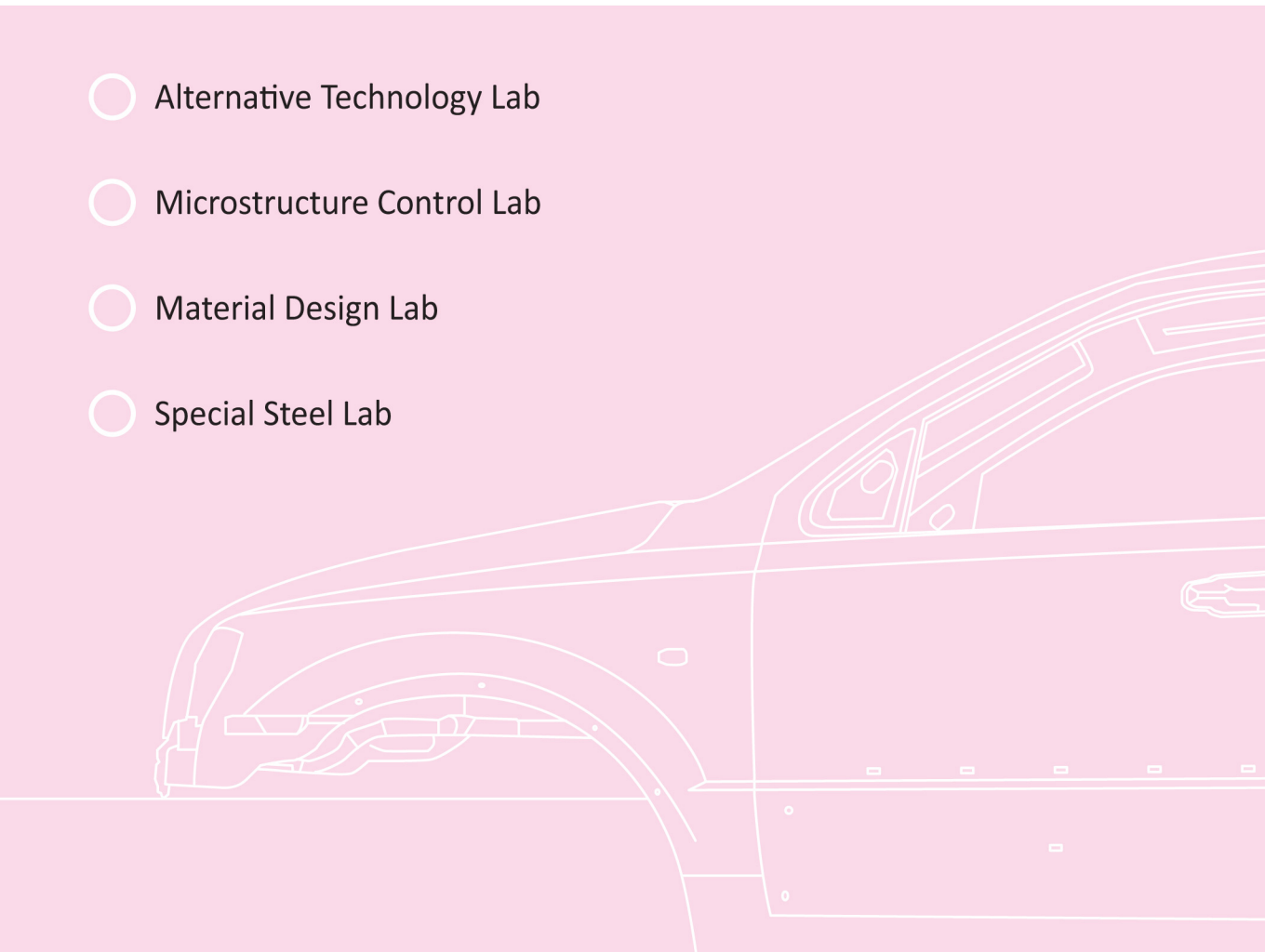
# Materials Development Center

Director: Sung-Joon Kim

The main activity of the Materials Development Center is understanding the physical metallurgy of various kinds of steels and finally developing new alloys such as high strength high ductility automotive steels, oriented or non-oriented electrical steels, high Mn cryogenic steels, ultra-lightweight high-Al steels, and high-nitrogen austenitic or lean duplex stainless steels. Thus, the relation among alloy composition, microstructure and material properties will be mainly investigated using computational tools, mechanical testing facilities and analytical tools such as SEM, EBSD, TEM and APT.

## Materials Development Center

- Alternative Technology Lab
- Microstructure Control Lab
- Material Design Lab
- Special Steel Lab





Global climate change and exhaustion of natural resources have started to restrict all parts of current human activities. Steel industry is also demanded to meet higher international standards in efficiency for manufacturing process and its products. Alternative Technology Laboratory (ATL) goes to innovation of steel production technology under the concept of consilience from science and engineering disciplines.

ATL is mainly concentrating upon electrical steels research among various fields of steel technology. It is evident that modern industrialized society heavily relies upon electrical energy converted from other forms of energy. We can find electrical power generators, transformers, and motors in all the surrounding living places. Electrical steels as Si-alloyed ferrous magnetic materials are key component for such kinds of energy conversion devices. Therefore, it is clear that improved quality products of electrical steels are hotly required to accord with international energy strategy. For example, development of high-grade electrical steels for energy efficient wheel motor is one of the emerging issues to realize future electric vehicles.

Electrical steels can be categorized in two products, grain-oriented and non-oriented electrical steels. Grain- oriented electrical steels have a controlled texture of (110) sheet surface and [100] crystal orientation relative to the rolling direction, Goss texture. Due to the special texture, magnetic flux density is anisotropic and maximized along the rolling direction. On the other hand, magnetic properties of non-oriented electrical steels are isotropic with (100) sheet surface and random crystal axis orientation, resulting in less efficient general purpose materials.

Four faculty members of ATL work synergistically with their expertise from various education and research backgrounds. But most of all, it should be emphasized that fresh-minded students and young researchers are always in the heart of ATL's activities. ATL members are eager to contribute the development of steel science and technology within warm and active environment of GIFT under strong support from POSCO. ATL is open to all the ideas in steels.

### RESEARCH AREAS

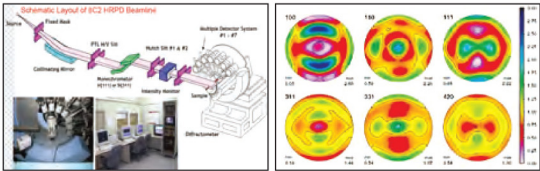
ATL's current research encompasses following areas, but not restricted:

#### PRODUCTION PROCESS AND ALLOY DESIGN OF ELECTRICAL STEELS

- Abnormal grain growth mechanism and process
- Alloy design for electrical resistive minimization
- Texture control of non-oriented electrical steels
- Asymmetric rolling and texture evolution

#### STRUCTURAL CHARACTERIZATION OF STEELS

- Twin and dislocation structure analysis of high-Mn steels
- Recrystallization and grain growth mechanism in high Mn steels
- Texture control via rolling and recrystallization process

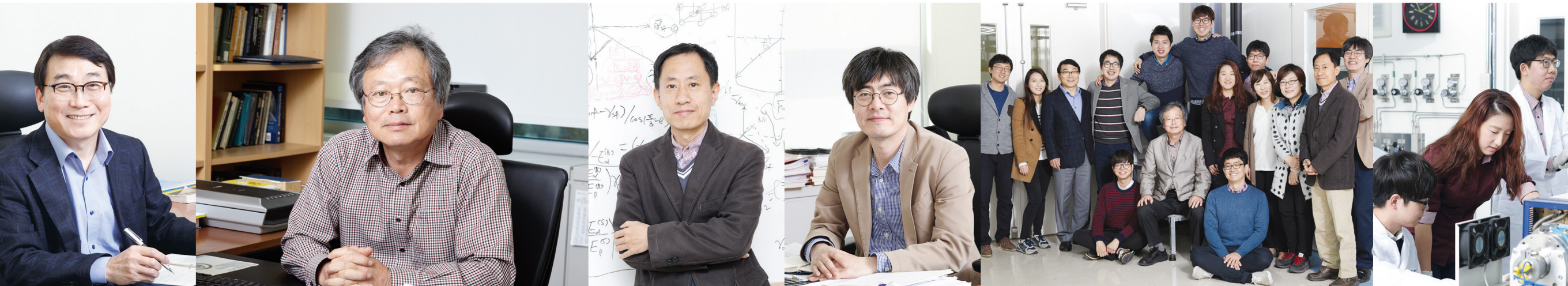


#### TEXTURE CONTROL VIA ROLLING AND RECRYSTALLIZATION PROCESS

Texture or preferred orientation is a fundamental phenomenon resulting from the microstructure evolution that takes place during various processes including casting and thermo-mechanical processing of materials. A strong texture development in a material results in property anisotropy of the material. For example, asymmetric rolling gives rise to shear deformation textures and grain refinement through the thickness of sheets. Here, a study is being made of optimization of thermo-mechanical processing to improve deep drawing capability of interstitial free steel sheets by enhancing the plastic strain ratio through controlling their textures. Asymmetric rolling process is also being tested to obtain the Goss texture of electric steel sheets, which might potentially reduce manufacturing cost drastically.



For further information, please visit <http://atl.postech.ac.kr/>



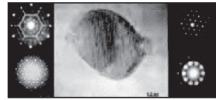


### MEETING THE NEEDS FOR ADVANCED FERROUS ALLOYS

In recent years, there have been ever increasing demands for energy conservation and environmental protection. Such demands place a great burden for materials scientists to develop high performance structural materials which have better mechanical properties than conventional materials. One obstacle is that the improvement in one property (e.g., strength) often results in the degradation of other properties (e.g., ductility, toughness). Understanding how the microstructure evolves during synthesis is of utmost importance for the development of high performance structural materials needed for various applications.

MCL aims to develop and study novel “tailor-made” steels with superior properties and functions by the control of microstructure, which, besides new knowledge, can ultimately lead to applications as new types of engineering materials. A concept for microstructure design is based on the combination of phase variables and scale variables. The recent development enables us to utilize phase variables such as interfacial property, thermal/mechanical stability, and morphology for design of structural materials. Combining the phase variables with the scale variables such as nano- or micro-scale will enable us to develop novel “tailor-made” steels with enhanced properties.

### RESEARCH AREAS



All the research programs at MCL require the detailed characterization of microstructure by advanced characterization techniques such as HREM, EBSD, etc. MCL’s current research programs as follows;

#### DEFORMATION BEHAVIOR OF MULTIPHASE STEELS

Microstructure of the most advanced steels consists of multiphase structure with various constituent phases, which respond to deformation in much different ways. This program is to understand the deformation behavior of multiphase steels under various conditions including the effect of temperature and strain rate.

#### DEVELOPMENT OF ADVANCED STEELS FOR CRYOGENIC APPLICATION



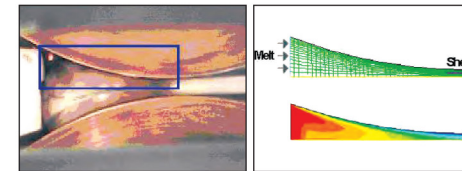
The steels used under extreme conditions such as cryogenic temperature require the optimum combinations of various properties such as strength, low temperature toughness, yield ratio,

weldability, etc. The ultimate goal of this program is to develop advanced steels which can be used at temperatures much lower than the ones conventional steels are currently being used at.

#### PHASE TRANSFORMATION BEHAVIOR

This includes the studies on phase transformation behavior of conventional steels as well as the non-equilibrium steels such as bulk amorphous steels, which possess excellent combination of strength and corrosion resistance.

#### PROCESSING

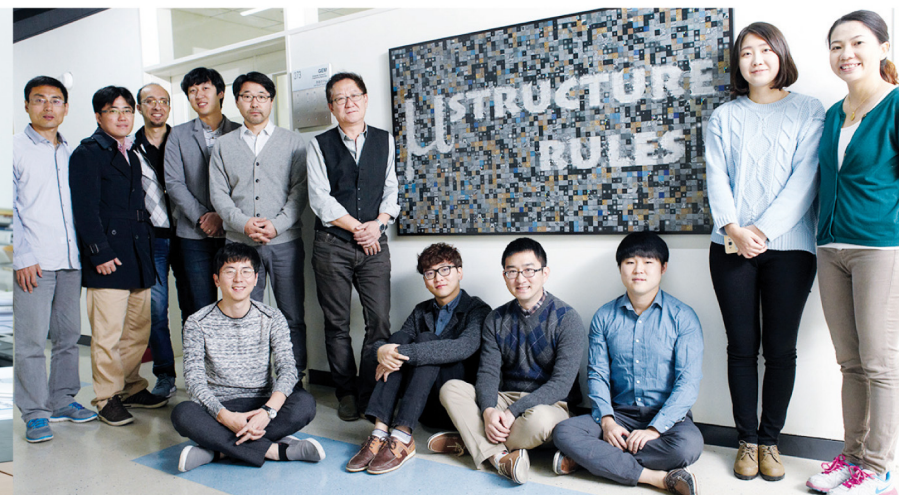


Conventional metal working processes such as hot/warm rolling are the subjects of this program. Fabrication of advanced steels by Twin-Roll Casting, our proprietary process, is also the focus of this program.

#### DEVELOPMENT OF LIGHTWEIGHT STEELS

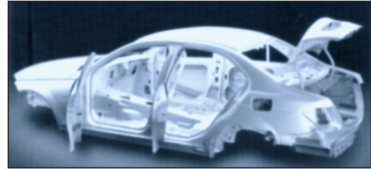
Recently there has been a growing interest in lightweight Al containing steels having very high specific strength. These can meet the demands, particularly from automotive industry, for energy conservation and environmental protection. However, these lightweight steels usually suffer from low ductility originating from Al addition. The goal of this program is to develop advanced lightweight steels which have excellent ductility and formability along with high specific strength.

For further information, please visit <https://mcl.postech.ac.kr>





## DESIGNING ADVANCED STEELS



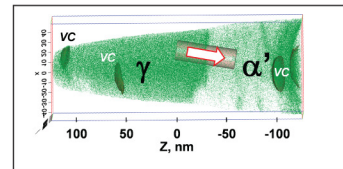
The focus of the MDL research is the physical materials science and technology of steel products. Within GIFT, MDL plays a research leadership role in the areas of advanced Automotive Steels, Galvanized products, Electrical Steels, Stainless steels and Steel grades related to Power Transportation and Generation. MDL also has considerable

expertise in the areas of steel products technologies, processing and process simulation, with a special emphasis on hot rolling, cold rolling, continuous annealing and galvanizing. In addition, ferrous alloy design, materials testing, physical properties determination, and steel micro-characterization using advanced techniques are also active research domains of MDL. By emphasizing technical innovation for steel products, MDL aims to set the agenda for future steel product development. In this manner, the research carried out within MDL is well positioned to be complementary to the research activities of the other world class materials research institutes.

## TEAMWORK IN RESEARCH

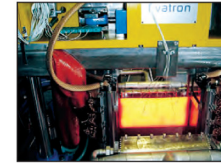
For graduate students, MDL is a unique place to do research in that it offers more than just a place to work on an advanced engineering diploma. The development of effective communication, organizational, and international team working skills is very important and given a lot of attention within MDL. This is achieved through the preparation of project progress meetings, the participation to international conferences, the writing of reports and journal publications.

During their graduate studies MDL students develop other crucial professional skills such as learning to do research work with constraints related to deadlines, means and clear deliverables. Most of the MDL research projects are carried out within university-industry collaborative programs on advanced steel research subjects.



## RESEARCH AREAS

### A UNIQUE APPROACH TO STEEL RESEARCH



Research within MDL has a pronounced focus on technology and technical innovations through steel research. Whereas most materials engineering research tends to be midway between the fundamental and the purely technical, true innovation, with the potential for a large impact on future development, is generated when the research emphasizes either the fundamentals or the advanced technologies. The MDL approach to steel products research, development and innovation therefore is driven by a strong industry-MDL interaction with clear medium term aims, and MDL also provides basic research support, on a long term basis, for strategic steel product domains.

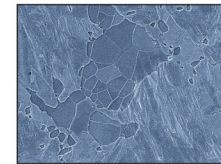
### AUTOMOTIVE STEELS

The focus of the current MDL automotive steels program is on formable high and ultra-high strength steels for automotive applications. This group of steels includes Dual Phase steel, Transformation-Induced Plasticity steel, Twinning Induced Plasticity steel, Martensitic steel, Press Hardening steel and Medium Mn steel. The research covers steel design concepts, processing issues and application-specific materials performance testing.



### ELECTRICAL STEELS

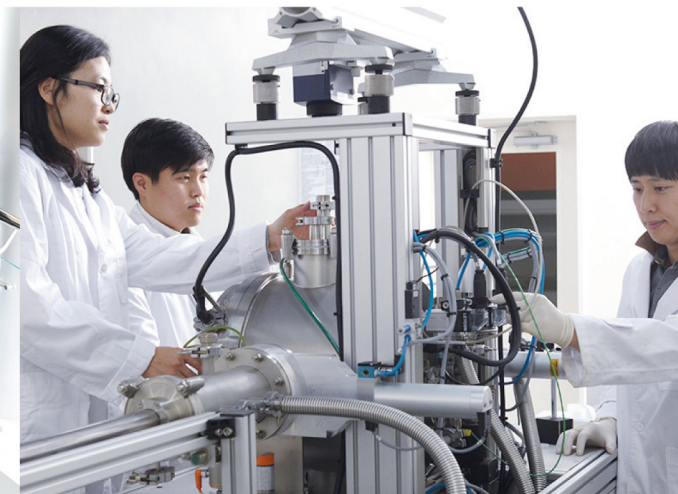
The program focus is on Grain-oriented Silicon steels, Non-oriented Silicon steels. The MDL research analyses the fundamental properties of these two key materials in energy transport and generation, with a special emphasis on domain engineering and magnetic loss control.



### STAINLESS STEELS

The aim of the Ferritic stainless steels program is develop new highly formable ferritic grades by advanced micro-plasticity analysis of their mechanical properties.

For further information, please visit <http://mdlpostech.com>





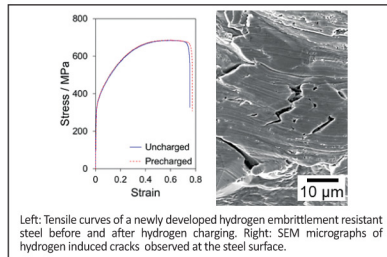
The special steels laboratory (SSL) deals with alloy design, processing technology, and characterization of diverse steels including stainless steels, heat resistant steels as well as advanced high strength steels (AHSS) for automotive application. With the globally growing interests in the reduction of energy consumption, efficient usage of energy, and new discovery and drilling of oil resources, the demands for special steels are rapidly rising, while the biggest challenge is to reduce the contents of expensive alloying elements in these steels. Thus, we welcome students who are willing to realize their dreams to develop special steels with high performance and low price.

## RESEARCH AREAS

1. Alloy design of novel stainless steels and heat resistant steels.
2. Correlation between mechanical properties and microstructure of alloy steels.
3. Development of 3rd generation AHSS.
4. Liquid metal embrittlement mechanism of Zn coated automotive steels.

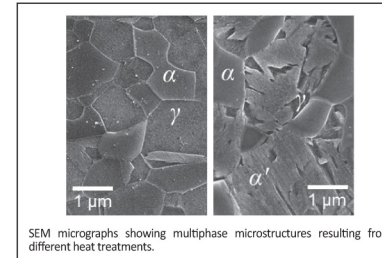
## RESEARCH PROJECTS

### DEVELOPMENT OF NITROGEN ALLOYED STAINLESS STEELS



High-nitrogen stainless steels have a great potential in the next generation energy industry and marine plant, since these alloys exhibit high strength and ductility as well as excellent corrosion and wear resistance. In this respect, we design a new class of nitrogen alloyed austenitic stainless steels with the assistance of thermodynamic calculations for the applications in hydrogen gas environment. The process technology and characterization of these newly developed alloys are investigated by various methods. In addition, fundamental studies on stacking fault energy, deformation mechanisms, and microstructural evolution are carried out to assess their effects on mechanical properties.

### MICROSTRUCTURAL CONTROL AND DESIGN OF 3rd GENERATION AHSS



The 3rd generation advanced high strength steels (AHSSs) are an attractive candidate for an automotive application, since they are economical and exhibit better joining capability in comparison with 2nd generation AHSSs.

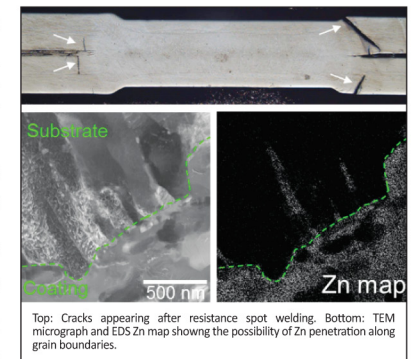
Owing to their multi-phase microstructure, the morphologies and fractions of different phases play a significant role in the resulting mechanical properties. By employing thermodynamic and kinetics

calculations as well as advanced characterization techniques, their microstructures are systematically tailored in order to optimize the resulting mechanical properties.

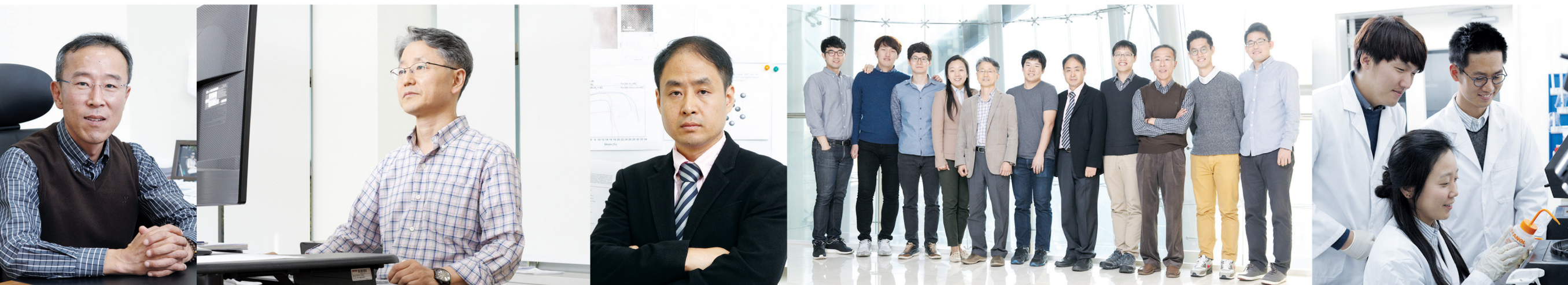
### LIQUID METAL EMBRITTLEMENT IN AUTOMOTIVE STEELS

High Mn steels, high temperature alloys, and many other high performance alloys show great promise for vehicles, power plants and chemical plants. For such applications, many steels are coated with Zn for corrosion resistance.

However, during the thermomechanical process or welding, these alloys suffer from sudden embrittlement, the mechanisms of which have not been well clarified. Therefore, to avoid the catastrophic failure of these steels, the embrittlement mechanisms are studied based on the investigation of materials properties such as elastic modulus, surface energy and effects of alloying elements as well as advanced characterization of the substrate/coating interface.



For further information, please visit <http://ssteel.postech.ac.kr>

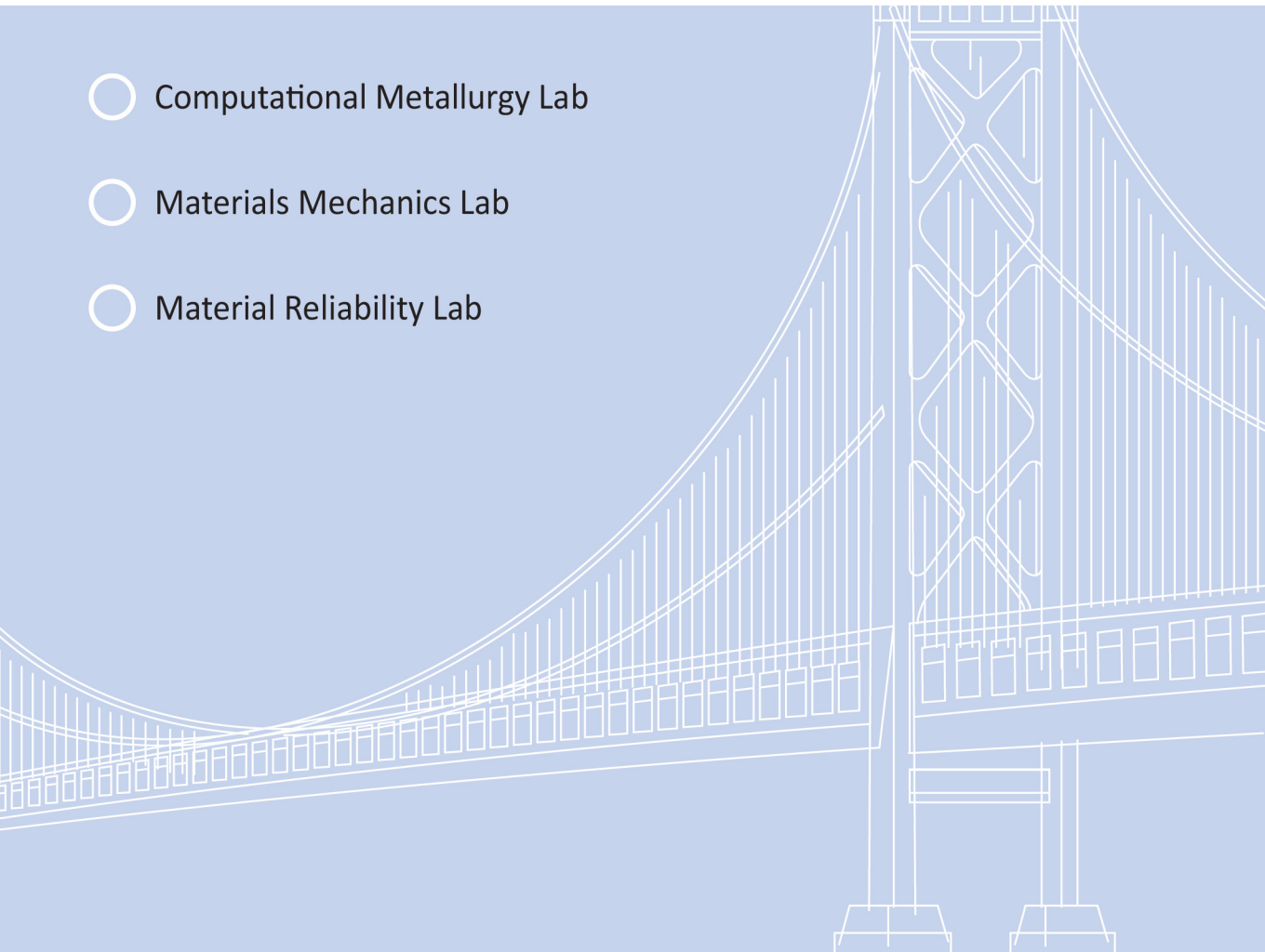






# Application & Solution Center

- Computational Metallurgy Lab
- Materials Mechanics Lab
- Material Reliability Lab



## Application & Solution Center

Director: Frédéric Barlat

### Vision and Strategy

The Application & Solution Center will create economic and academic values by developing new steels and material customer solutions originating from world-class academic research on material design, product manufacturing, reliability and durability. The C Center will develop and establish promising advanced technology concepts for new steels and products based on the simultaneous application of state-of-the-art multiphysics and multiscale modeling, and advanced experimental exploration.

### Goal and Approach

The A&C Center focuses on the development of advanced materials, as well as product manufacturing and performance through a synergistic combination of experimental, analytical and numerical approaches. The goal of the A&C Center is to develop modern steels and selected materials such as titanium alloys, as well as manufacturing solutions, to design products with advanced mechanical performance, suitable formability, and fracture, fatigue and hydrogen embrittlement resistance. This research requires a profound understanding of physical metallurgy, as well as mechanical and numerical sciences, in order to clarify the microscopic and macroscopic mechanisms responsible for the underlying physical phenomena involved in these applications, and a combination of imagination, intuition and the ability to recognize novelty, in order to bring technological achievements beyond the previously known limits.

### Major Research Areas

- 1) Mechanisms of property enhancement for ferrous alloys in non-friendly environment
- 2) Development of high strength steels with high resistance to hydrogen embrittlement
- 3) Computational physical metallurgy and microstructure analysis
- 4) Microstructure optimization for the mechanical performance of steels and Ti alloys
- 5) Constitutive modeling and identification of the plastic behavior of advanced materials
- 6) Computational forming process simulations of sheet metal for advanced high strength steel





There is much to be gained by creating theory appropriate for materials science, in particular, which is experimentally verifiable and which does not compromise with the complexity of technology. Modelling as a subject has become as much a part of steel metallurgy as experimental characterization for two reasons. Firstly, to compete, industry must achieve solutions using minimal resources. Secondly, scientists are excited by the quantitative expression of multivariate problems.

Our goal is to create and apply theory which leads to novel steels and associated technologies in the near future. It is rare that mathematical models alone influence an outcome. We appreciate that it is more often the case that models are a part of a process which includes insight and experimental observations.

The subject is necessarily interdisciplinary, so the members studied in our group have had backgrounds of metallurgy, chemical, mechanical and electrical engineering, physics, mathematics and computer science in their undergraduate studies.

## RESEARCH AREAS

- Development and application of mathematical methods based on the physical principles of metallurgy
- Experimental validation of alloy and process design principles
- Degradation of ferrous alloys in non-friendly environment
- Ultra-high strength steels having bainitic matrix microstructure
- Generic theory for hydrogen in steels
- Permeation of hydrogen through steels
- Simulation of oxidation of steel surfaces

## EXCURSIONS INTO UNUSUAL AREAS

- Martensite in heterogeneous materials
- Ab initio thermodynamics
- Tetragonal ferrite
- TiC reinforced steel-matrix composite

## ACHIEVEMENTS

- Complete description of martensite in computer algorithms
- Automotive steel with interphase precipitation based on Ti, Mo, W, C
- Formable superbainitic steel
- Mathematical model for oxide formation on steels
- Mechanism for hydrogen effects on TWIP steels
- Controlling retained austenite for ultrahigh strength formable steels

For further information, please visit <http://cml.postech.ac.kr>





## GENERAL INTRODUCTION

The Materials Mechanics Laboratory (MML) contributes to the development of innovative forming processes and products. MML collaborates with academia, research institutions and industry worldwide to explore progress in forming technologies. MML focuses its research on advanced high strength steels (AHSS) and other materials of interest. The empirical rules that have been used to develop sheet forming processes and products with traditional steels are no longer valid with AHSS. Therefore, it is necessary to develop advanced numerical and experimental tools to successfully design AHSS forming processes and products.

The numerical methods, which are conducted using commercial finite element codes, are very efficient to guide and optimize forming processes. One of the main inputs to the simulations is the so-called constitutive description, the mathematical representation of the material elasto-plastic behavior. The challenge of this research is to develop suitable, accurate and efficient constitutive models, which are tailored to new steel generations, yet simple enough to allow time efficient numerical simulations at the scale of industrial products. Another challenge is to develop advanced mechanical testing, characterization and analysis in order to identify suitable constitutive parameters. The validation of forming simulation results with laboratory scale experiments is imperative. MML is equipped with a direct drive digital servo-press perfectly suitable for research, prototyping and small production trials. The challenge in this technology is to determine the optimum processing paths in a seemingly boundless realm of possibilities. This optimization requires a synergistic interaction with numerical modeling activities.

## RESEARCH AREAS

### GENERAL RESEARCH TOPICS

- Advanced material characterization and forming processes
- Meso- and macro-scale constitutive modeling of plasticity
- Numerical simulations of forming processes

### SELECTED CURRENT TOPICS

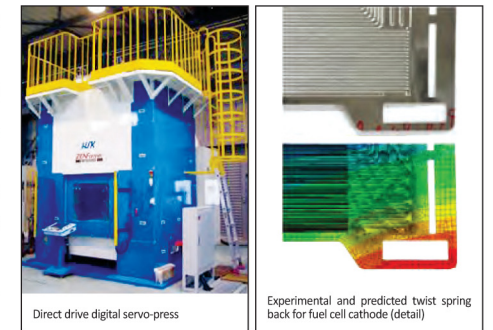
- Continuum and crystal plasticity-based modeling of multi-phase steels
- Virtual field methods based on digital correlation imaging for constitutive model identification
- Springback reduction during forming of AHSS automotive components

### SPECIFIC EQUIPMENT AND SOFTWARE

- MTS 500 kN tension-compression machine
- Erichsen sheet metal testing machine, Model 145-60
- Erichsen bulge/FLC tester, Model 161, 200 mm opening diameter
- Kokusai in-plane biaxial tensile testing machine, KBAT-100
- HSK direct drive digital servo-press ZENFormer, MPS8300DS, 2 slides
- Vic-3D digital image correlation system
- High-speed tensile testing machine & Photron FASTCAM SA-X2 high speed camera
- Software: ABAQUS, LS-DYNA, PAM-STAMP, FORGE

### ACHIEVEMENTS

- Advanced material model to predict Bauschinger effect and other anisotropic hardening effects in AHSS
- Implementation of various advanced constitutive equations in finite element commercial software (ABAQUS, DYNA-3D, PAMSTAMP)
- Prediction of springback for a number of AHSS DP, TRIP and TWIP for automotive application with accuracy of 95% or higher
- Successful forming of thin ferritic stainless steel sheets for fuel cell bi-polar separator using digital servo press
- Model and FE software to predict forming process and material properties after hot press forming
- Constitutive model identification for large strain plasticity using full field DIC measurements and virtual fields optimization method



For further information, please visit <https://sites.google.com/site/mmlpostech/home>





### TOWARDS HIGH PERFORMANCE MATERIALS

High performance materials are increasingly needed in various industries, and as a consequence, worldwide efforts have been devoted to develop materials with higher strength and ductility, excellent resistance to fracture and fatigue resistance, enhanced formability and so on. Such materials will form essential structural parts of next generation transportation vehicles, i.e., high speed trains, automobiles, supersonic aircraft and space shuttles.

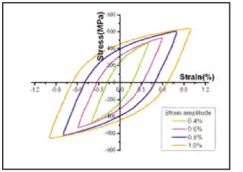
The Material Reliability Laboratory (MRL) focuses research efforts to investigate various mechanical properties (e.g., fatigue, hydrogen embrittlement and formability) of structural metallic materials in relation to its microstructural factors and clarify detailed mechanisms responsible for the phenomena.

High cycle and low cycle fatigue of high strength steels are extensively studied in the context of microstructural, mechanical and environmental parameters. Also, life prediction models for cyclically stressed components are developed and confirmed by experimental verification. Formability enhancement of high strength steels, Ti and Mg alloys is targeted by controlling grain size, morphology, second phase particles, texture and so on. Since hydrogen embrittlement (HE) is frequently observed in the high strength steels, efforts are also devoted to clarify detailed mechanisms and to provide remediation to minimize damage due to hydrogen.

### RESEARCH AREAS

#### LOW-CYCLE AND HIGH-CYCLE FATIGUE BEHAVIOR

- Effect of microstructural parameters of fatigue properties of high strength steels
- Effects of pre-strain and deformation mode on fatigue properties
- Fatigue properties of high manganese steels for automotive application
- Very high cycle fatigue properties and mechanisms

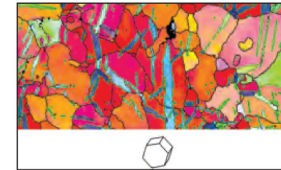


#### HYDROGEN EMBRITTLEMENT (HE) OF STEELS

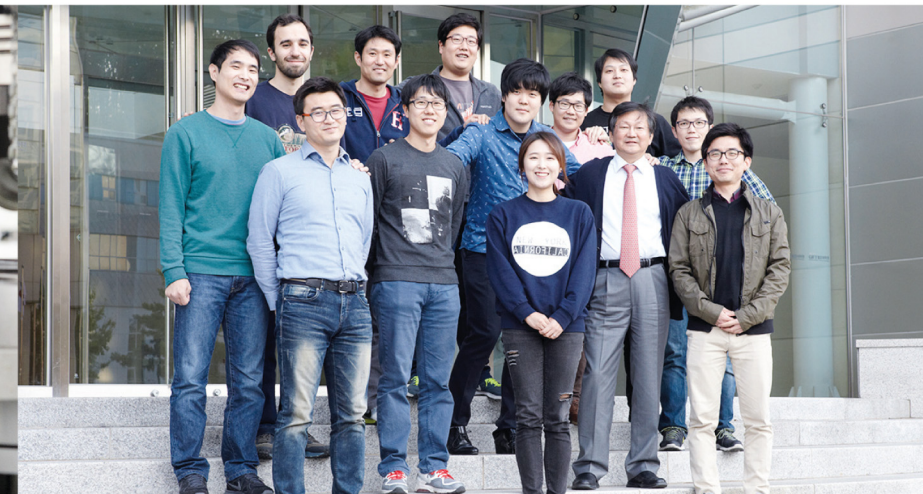
- Effect of microstructural parameters on HE of high strength steels
- Effect of alloy composition on HE of stainless steels and TWIP steels
- Hydrogen detrapping activation energy of various defects
- Establishment of reliable and precise hydrogen analysis

#### FORMABILITY OF STRUCTURAL MATERIALS

- Mechanical and Microstructural factors affecting the formability of high strength steels
- Determination of optimum processing conditions for hard-to-work materials
- High strain rate and low temperature superplastic deformation
- Grain refinement via severe plastic deformation methods



For further information, please visit <http://csleelab.com>





# Academics

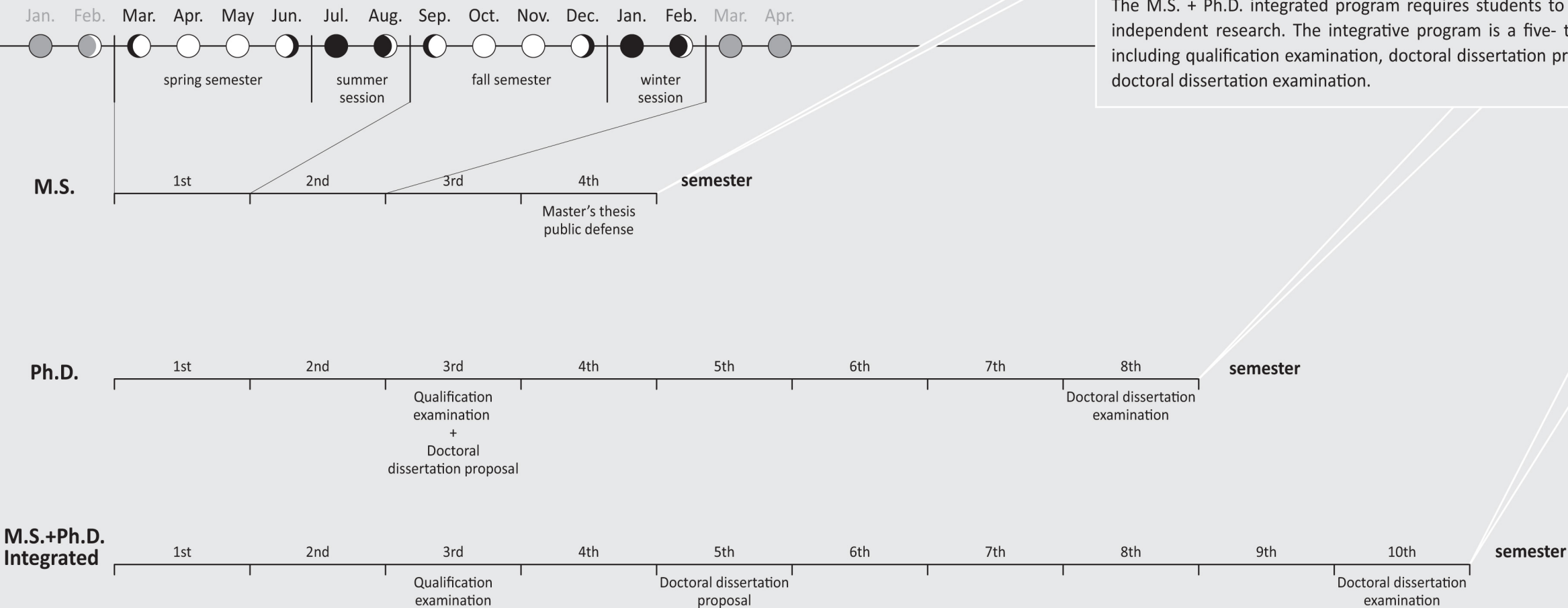
The main objective of GIFT is improving the career potential of graduates working in iron and steel related industries through well-balanced coursework and independent research. The GIFT program is designed to educate each graduate focusing on ferrous alloy fundamentals, innovation in steel products, and industry-related technologies.

GIFT courses emphasize an interdisciplinary approach combining materials science fundamentals, steel production, processing fundamentals, and process control. The courses are highly specialized in comparison to general materials science education at most other universities. Engineering curricula in most departments may typically offer thermodynamics, but GIFT offers a graduate thermodynamics course specifically applied to iron and steel research applications. In addition, students can experience the practical applications of the theory and fundamentals taught by GIFT faculty working with experts from POSCO and RIST.

The M.S. program requires students to carry out an individual research project and write an independent M.S. thesis as a part of the degree requirements. The M.S. program is designed to be completed in two years.

The Ph.D. program requires the students to carry out original and independent research. The Ph.D. program is a three- to four-year program including qualification examination, doctoral dissertation proposal evaluation, and doctoral dissertation examination.

The M.S. + Ph.D. integrated program requires students to carry out original and independent research. The integrative program is a five- to seven-year program including qualification examination, doctoral dissertation proposal evaluation, and doctoral dissertation examination.





Course Work

A. CATEGORIES OF COURSES

GIFT courses are composed of two main categories: major courses and research courses. Major courses are offered along with the GIFT curricula, and research courses consist of seminar, thesis research, and language courses. Major courses emphasize an interdisciplinary approach to the field of steel technology by combining all relevant aspects of the following engineering disciplines: Materials Science, Metallurgy, Mechanics, Chemistry, Solid State Physics, Manufacturing Technology, Process Control, and Computer Science. All major courses are taught in English by GIFT faculty who are renowned experts in the subjects they are teaching. Research courses give students the opportunity to advance their research ability in various ways. Diverse scholars in ferrous technology have been invited to the Seminars in Ferrous Technology course on every Thursday. Language courses also help students become global-minded researchers. To expand student’s view point as an international researcher, the seminar and language courses are mandatory for all GIFT students.

GIFT students should satisfy the credit requirements for graduation. Twenty eight (28) credits, including eighteen (18) major credits and ten (10) research credits are required to complete the M.S. program. Thirty two (32) credits, including twelve (12) major credits and twenty (20) research credits are required to complete the Ph.D. program. Sixty (60) credits, including thirty (30) major credits and thirty (30) research credits are required to complete the Integrative program.

B. CURRICULA

The GIFT curriculum has a unique feature: all courses are classified in three levels and in three modules.

GIFT Course Curriculum by Level

Basic courses	Designed for those who have been educated by non-Material Sciences and Engineering program; This is to help students’ stepwise adaptation to ferrous technology.
Core courses	Designed to deliver major knowledge on principles and applications relevant to ferrous technology.
Advanced courses	Designed to bring students to have in-depth knowledge with cutting-edge professional topics.

GIFT Course Curriculum by Module

Chemical Metallurgy Module	Metallurgy of iron- and steel-making process Thermodynamics and reaction kinetics Thermal and fluid engineering Surface and interface related phenomena	CSL, EML, CTL
Physical Metallurgy Module	Solid state phase transformation in steel Microstructure control and characterization Crystal structure and defects Steel products and processing	ATL, MCL MDL, SSL, CML
Mechanical Metallurgy Module	Response of metals to thermo-mechanically applied forces Strengthening mechanism Numerical approaches on metal forming	MML, MRL

GIFT freshmen are assigned to each lab during the orientation period. His/her academic advisor will guide them to register for the courses along with the classification of levels and modules. In consultation with the faculty members, students can complete their course work and deepen their knowledge of the research field.

Graduation Requirements

MASTER'S DEGREE

- THE MASTER’S THESIS PUBLIC DEFENSE  
The M.S. degree candidates present the results of their individual research project during a public defense at the end of their fourth semester. The candidates are required to defend their master’s thesis in public, giving an oral presentation in English. The master’s thesis public defense consists of two parts: The oral presentation and a question and answer session. The thesis examining committee, which is composed of three professors including the academic advisor evaluates the defense and makes a unanimous decision on “PASS” or “FAIL” of the candidate.

DOCTORAL DEGREE

- THE QUALIFICATION EXAMINATION  
The qualification examination (Q.E.) guarantees that a student passing this exam is qualified to prepare his/her own doctoral dissertation. A student who fails this exam can’t proceed in his/her Ph.D. Program. The Q.E. is held in the 3rd semester of the Ph.D. program. Students must complete 12 course credits before Q.E..  
The Q.E. consists of four parts: A literature review, Ph.D. research project, written literature review & project description (20 pages or more), and general knowledge. The Q.E. candidate should give an oral presentation in English.  
The Q.E. committee is composed of five professors including the academic advisor. The committee deliberates and makes a unanimous decision on “PASS” or “FAIL” of the candidate.
- THE QUALIFICATION EXAMINATION  
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- THE DOCTORAL DISSERTATION PROPOSAL  
The evaluation on the doctoral dissertation proposal occurs simultaneously with the Q.E. Thus a candidate who passed the Q.E. is regarded as being successful in the doctoral dissertation proposal evaluation as well.
- THE DOCTORAL DISSERTATION EXAMINATION  
The doctoral dissertation shows the finest research work of a student made in his/her years of efforts. Before the examination, the dissertation of a candidate must be accepted and published in a SCI (Science Citation Index) journal.
- The doctoral dissertation examining committee evaluates the dissertation. The committee must be composed of five professors including the thesis advisor. They evaluate an oral presentation of the candidate considering logicity, excellence, practicality, and creativity. The committee deliberates and makes a unanimous decision on “PASS” or “FAIL” of the candidate.

M.S.-Ph.D. INTEGRATED DEGREE

- THE QUALIFICATION EXAMINATION  
The Q.E. of the integrative course is the same as that of the doctoral course. The Q.E. is held in the 3rd semester of the Integrative course.  
The Q.E. consists of two parts: Research project performance results and basic knowledge in his/her specialty. The Q.E. candidate should give an oral presentation in English.  
The Q.E. committee is composed of three professors including the candidate’s academic advisor. The committee deliberates and makes a unanimous decision on “PASS” or “FAIL” of the candidate.
- THE DOCTORAL DISSERTATION PROPOSAL  
The evaluation on doctoral dissertation proposal occurs in the 5th semester of the Integrative program. The Doctoral Dissertation Proposal consists of two parts: A literature survey (20 pages or more) and research project plan. The Doctoral Dissertation Proposal committee is composed of five professors including the candidate’s academic advisor.
- THE DOCTORAL DISSERTATION EXAMINATION  
The doctoral dissertation of the integrative course is the same as that of the doctoral course.



# How to Apply

GIFT is looking for outstanding students who will lead the steel-based industries of the future. There are two times for admission in a year. Application procedures consists of eight steps as follows:  
Online application > Submission of the required materials by post > Appraisal of application > Interview > Admissions decision & notification > Interview for lab assignment > Orientation > Enrollment and start of graduate study

## ADMISSION TIMELINE

Semester Begins	Application Deadline	Announcement of Admissions Decision
September or February of the following year	1st week of January ~ 4th week of April	End of June
February	4th week of April ~ 3rd week of October	End of November

## ELIGIBILITY

- Applicants for M.S. and Integrated program must hold, or expect to hold before enrollment at GIFT, a Bachelor’s degree.
- Ph.D. applicants must hold, or expect to hold before enrollment at GIFT, a Bachelor’s and a Master’s degree.
- Applicants must satisfy the required score of English proficiency. For specific information about the score and exceptions, please refer to ‘Application Requirements’.
- International applicants should NOT hold Korean citizenship.  
(Korean citizens who hold dual citizenship should apply as Korean applicants.)

## APPLICATION REQUIREMENTS

Applicants must complete their online application and submit the required documents by post.

### 1. Submit application online

- 1) Applicants must fill out the online application
- 2) Personal statement, research plan and Curriculum Vitae
  - Download format from the website: <http://admission.postech.ac.kr/linkUsen.do?f=sub3-2>

### 3) Copy of passport

### 4) Signed consent form

### 5) List of honors and awards (optional)

※ NOTE: GIFT charges no application fee.

### 2. Submit required documents by Post

- 1) Official transcript(s)
- 2) Degree certificate(s)
- 3) Two recommendation letters
- 4) Score report of English proficiency test

- Certificate of English proficiency test

TOEFL PBT	TOEFL iBT	TEPS	TOEIC	IELTS
550	79	637	800	6.0

Scores must be sent directly from the administering institution to POSTECH (POSTECH Institution code for ETS: 0329) and received by the Office of Graduate Admissions and Student Affairs no later than the application deadline.

※ Exception:

- Applicants who have graduated from a university in Australia, Canada, Ireland, New Zealand, Great Britain, and the United States are exempt from the English proficiency test requirement.
- Non-native English speakers from a university where English is used as a means of education may submit ‘Proof of Instruction Language’ instead.

## Financial Aids and Other Support

### A. POSCO FELLOWSHIP\*

Matriculation Fee		Fully Supported
Tuition		
Living expenses assistance (per month)	M.S.	1,000,000 KRW
	Integrative	1,000,000 KRW
	Integrative (POSCO Special recruitment students**)	2,500,000 KRW
	Ph.D.	1,500,000 KRW
	Ph.D. (POSCO Special recruitment students**)	3,000,000 KRW
Dormitory		Fully Supported

\* POSCO fellowship is given to all GIFT students. However, students funded by Korean government or other industries should not be supported by POSCO Fellowship.

\*\* POSCO special recruitment students should work for POSCO for a certain period of time.

### B. OTHER SUPPORTS

#### Short-term study abroad program

All GIFT students are encouraged to participate in the short-term study abroad program (up to 6 months for M.S. and 1 year for Ph.D. students). Students can experience and participate in research projects of ferrous technology with global perspective. There is partial financial aid for transportation and housing.

#### Plant tour

GIFT operates the plant tour visiting the field of ferrous industries in every two years. Visiting POSCO plant, Doosan Heavy Industries, Hyundai Heavy Industries, and etc., students can experience how the ferrous technology is applied in various industrial fields.



# 입시 요강

철강대학원은 미래의 철강 산업 분야에 기여할 특출하고도 잠재력 있는 학생들을 찾고 있다. 이를 위해 연중 2회의 입학 전형을 실시하고 있으며, 입학 전형은 다음 과 같이 여덟 단계로 구성되어 있다.  
온라인 지원 → 원본 서류 제출(필요시) → 서류 심사 → 면접 → 최종 심의 및 합격자 발표 → 랩배정 인터뷰 → 오리엔테이션 → 등록 및 학기 개강

분류	개강 학기	지원 기간	합격자 발표
특차 전형	9월, 2월 중 선택	1월 중	1월 중
일반전형	9월, 2월 중 선택	1월 첫째 주 ~ 4월 4째 주	6월 말
	2월	4월 4째 주 ~ 10월 3째 주	11월 말

- 지원자격**
- 석사과정 및 통합과정 : 국내외 대학에서 이학 또는 공학 학사학위 취득(예정)자, 법령에 의하여 이와 동등한 학력이 있다고 인정된 자
  - 박사과정 : 국내외 대학에서 이학 또는 공학 학사학위 취득(예정)자, 법령에 의하여 이와 동등한 학력이 있다고 인정된 자
  - 영어 요건을 충족한 자(자세한 사항은‘제출 서류’참고)
  - 외국인 지원자는 한국 국적을 소지하지 말아야 하며, 한국인 중 이중 국적을 소지한 자는 내국인으로 지원해야 함 (국적 사항은 국문 입시 요강을 참고하기 바람)

- 제출 서류**
- 가. 온라인 지원  
POSTECH 입학학생처 홈페이지 http://admission.postech.ac.kr에 가입 및 로그인 후, ‘원서 작성’ 웹페이지에서 온라인 지원서 작성  
※ 철강대학원은 전형료를 받지 않음
- 나. 공통서류  
입학지원에 필요한 모든 서류는 영문으로 작성되어야 함
- 입학 원서 1부 - 자기소개서 및 연구계획서 각 1부\*
  - 학부 졸업(예정)증명서 및 성적증명서 - 석사 학위(예정)증명서 및 성적증명서 (해당자에 한함)
  - 다음의 영어요건 중 1가지를 반드시 충족해야 함  
(기준에 미달되는 성적표는 접수하지 않으며 지원서류 미비로 처리됨) - 공인영어성적 기준 점수 이상 취득

TOEFL PBT	TOEFL iBT	TEPS	TOEIC	IELTS
550	79	637	800	6.0

※ TOEFL, IELTS는 해당 기관에서 직접 우편발송한 경우만 인정 (ETS용 POSTECH code: 0329) TOEIC, TEPS의 경우, 해당기관에서 직접 우편 발송한 성적표 이외에 지원자가 직접 온라인 발급받은 성적표도 인정함. 단, 온라인 발급번호를 통한 원본 여부가 확인되었을 경우에 한함.  
※ 공인영어성적의 유효기간은 지원일로부터 2년 이내에 한함

- ※ 기관특별시험의 경우 POSTECH 기관토플시험(ITP)만 인정하며, 그 외의 성적은 인정하지 않음
  - ※ 영어요건 면제 대상:
    - 영어권 대학 학위취득(예정)자 (뉴질랜드, 미국, 아일랜드, 영국, 캐나다, 호주) 단, 한국 대학과의 공동학위는 인정하지 않음
    - POSTECH 영어인증 이수(예정)자
    - POSTECH 박사과정 연계자
  - 이력서\*
  - ※ 해당 서류는 본 대학원 지정서식을 POSTECH 입학학생처 홈페이지‘입학안내 →모집요강 →철강대학원’에서 다운로드 후 작성하여 업로드나 우편제출
- 다. 선택 제출 서류
- 석사학위논문 별쇄본 및 연구실적물 1부
  - 지도교수 추천서 2부 (내국인의 경우 박사과정 지원자만 지도교수 추천서를 제출함)
  - 재직증명서 및 기관장 확인서(또는 동의서) 1부 (위탁생 또는 재직자에 한함)
  - 학위조회동의서 1부 (해외 대학(원) 졸업(예정)자에 한함)

**장학금 및 학생 지원내역**  
철강대학원은 학생들에게 아래와 같이 등록금 및 장학금을 지원하고 있으며, 각종 학생활동 지원 및 취업기회를 보장하고 있음  
가. 등록금 및 장학금 지원 내역

입학금 등록금		전액 지원	구분
생활비보조금	석사	1,000,000원/월	
	통합	1,000,000원/월	POSCO Fellowship
	통합(POSCO특별채용생**)	2,500,000원/월	
	박사	1,500,000원/월	POSCO Fellowship
	박사(POSCO특별채용생**)	3,000,000원/월	
기숙사비		전액 지원 80,000원/월	학생이 매 학기 초에 기숙사비를 일시 납부한 후에 매월 상환됨

\* POSCO Fellowship 은 철강대학원 모든 석·박사 재학생에게 지원 되나, 정부 위탁생 또는 재직자는 지원대상에서 제외 됨  
\*\* POSCO 특별 채용생은 졸업 후 일정 기간 POSCO근무를 의무화 함

**나. 기타 지원 내역**  
해외단기유학 : 미국, 영국, 호주 및 일본 등 해외의 대학 또는 연구기관에 국제적인 연구 프로젝트 참가 등을 위한 단기연수 시 교통비, 숙박비 및 추가생활보조금을 지원 (단, 해당 연구기관에서의 재정 지원이 있을 경우 지원금액은 달라질 수 있음)  
산업체 견학 : 철강대학원 학생들은 2년 마다 한번씩 POSCO, 두산중공업, 현대중공업 등 국내의 철강 관련 산업체를 방문하여, 철강 산업 현장에 대한 이해를 높일 수 있음



# Internship Program

GIFT offers an Internship Program (Student Research Participation Program) in the summer and winter sessions. 3rd or 4th year undergraduate students, who are very interested in Ferrous Technology studies, systems and backgrounds, and/or in GIFT lab activities and system, are encouraged to participate in our internship program.

## Overview

The duration of the GIFT Internship program is approximately one month.  
Free student dormitory housing and transportation (for international applicants, round trip air fare economy only, for Korean applicants, KTX or Bus fare) will be provided.  
Living expense will be assisted. (KRW 500,000 / 4 weeks)

## Required Application Documents

- Application Form
- An Official Academic Transcripts in English
- \* If transcripts do not indicate GPA(Grade Point Average), the applicant must convert the letter grades appropriately into GPA and show it on the application document.
- Personal Statement (primarily the description of the applicant’s study plan)
- Verification of English proficiency (TOEFL score or the equivalent)

## Schedule for the Internship Program

Session	Summer	Winter
Application Deadline	2nd week of May	end of November
Final Result Announcement	1st week of June	end of December
Period of the program	July	January

You can apply at any time by e-mail with required application documents.  
But it should be noticed that your application will be evaluated only if it is submitted to a deadline: the second Friday of May for the summer session and the fourth Friday of November for the winter session.  
Send application documents by e-mail to the staff in charge of admission:  
Eun Mi Jung ✉enmei@postech.ac.kr

# Postechian Participation

## GIFT Research Participation Program for POSTECH Undergraduates

GIFT introduces a Research Participation Program during semesters for POSTECH undergraduate students only. This is to offer opportunities for the POSTECH undergraduates who are interested in GIFT to figure out what GIFT is. If you want to have a research experience at GIFT, you can apply for GIFT Research Participation Program for POSTECH Undergraduates.

## Required Application Documents

- Application Form
- An Official Academic Transcripts in English
- \* If transcripts do not indicate GPA(Grade Point Average), the applicant must convert the letter grades appropriately into GPA and show it on the application document.
- Personal Statement (primarily the description of the applicant’s study plan)

## FAQ

- Q: When can I apply for this program  
A: At any time during semester.
- Q: How long can I participate?  
A: More than 4 weeks.
- Q: Is there any financial aid?  
A: Yes, GIFT supports 500,000KRW/4 weeks as a bursary.
- Q: How can I apply  
A: Submit the application, transcript & personal statement to the staff in charge of admission by e-mail.  
(Download the relevant forms which can be found at the GIFT website:  
<http://gift.postech.ac.kr> > ADMISSION > Internship Program)





People



Faculty

Distinguished  
Visiting  
Professor

Research  
Faculty

Affiliate  
Faculty

Professor  
Emeritus

Retired  
Faculty

Staff





### Frédéric Barlat, Ph.D.

Professor, Director of A&S Center

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🌐 <https://sites.google.com/site/mmlpostech/home>

### Education

1984. Ph.D., Grenoble Institute of Technology, France

1980. B.S. & M.S., Ecole Nationale Supérieure d'Arts et Métiers, France

### Experience

2007-Present: Professor, Director of A&S center of GIFT, POSTECH

1987-2007: Senior Engineer to Technology Specialist, Alcoa Inc., Alcoa Technical Center, Alcoa Center, PA, USA

1986-1987: Assistant Professor, Grenoble Institute of Technology, France

1984-1986: Research Associate, Alcoa Inc., Alcoa Technical Center, PA, USA

### Specialty

- Continuum mechanics, fracture mechanics, metal plasticity
- Anisotropic plasticity, constitutive behavior modeling, formability, metal forming, fracture
- Polycrystal plasticity, crystallographic texture, damage
- Microstructure/ property relationships



### Jung-Wook Cho, Ph.D.

Associate Professor

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🌐 <http://ctlab.postech.ac.kr>

### Education

1998. Ph.D., Metallurgical Engineering, Tohoku University, Japan

1991. M.S., Metallurgical Engineering, POSTECH, Korea

1989. B.S., Metallurgical Engineering, Seoul National University, Korea

### Experience

2016-Present: Associate Professor, GIFT, POSTECH

2012-2016: Research Associate Professor, GIFT, POSTECH

1998-2012: Principal Researcher, Steelmaking Research Group, POSCO, Korea

1991-1996: Researcher, Research Laboratories, Dong-Bu Steelmaking Co., Incheon, Korea

### Specialty

- Mold and Tundish metallurgy
- Application of glass science to design of metallurgical slags and fluxes
- Controlling solidification microstructure of slabs
- Noble casting technologies for continuous casting of high alloy



### Bruno C. De Cooman, Ph.D.

Professor

✉ decooman@postech.ac.kr

☎ +82 (0)54 279 9013

🌐 <http://mdlpostech.com/>

### Education

1987: PhD, Materials Science and Applied Physics, Cornell University, USA

1983: MS, Materials Science and Applied Physics, Cornell University, USA

1982: MS, Solid State Science, Syracuse University, USA

1980: Burgerlijk Ingenieur, Rijksuniversiteit GENT, Belgium

### Experience

2005-Present: Professor, GIFT, POSTECH

1999-2005: Director, Laboratory for Iron and Steelmaking, Universiteit Gent

1998-2004: Full Professor, Tenured, Metallurgy and Materials Science, Universiteit Gent

1996-1998: Coordinator Coatings Research Group, OCAS NV, Professor, Metallurgy and Materials Science, Universiteit Gent

1990-1995: R&D Technologist, OCAS NV, Belgium

1987-1990: Group Leader, Philips Natuurkundig Laboratorium, the Netherlands

1987-1988: GE-Cornell University Research Associate, General Electric, USA

1982-1987: Graduate Research Assistant, Cornell University, NY, USA

1980-1982: Graduate Research Assistant, Syracuse University, NY, USA

### Specialty

- Materials science of engineering materials: semiconductors, ceramics, coatings and metals.
- Microstructure-properties relationships in advanced steel products
- Rolling, annealing, continuous galvanizing, and PVD coating of advanced steel.
- Phase transformations, precipitation and recrystallization kinetics in advanced steels
- DP steel, TRIP steel, CP steel, Martensitic steel, Press Hardening steel and Medium Mn steel.



### Sung-Mo Jung, Ph.D.

Professor, Director of Green and Clean Technology Center

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🌐 <http://eml.postech.ac.kr>

### Education

1998. Ph.D., Materials Science and Engineering POSTECH, Korea

1993. M.S., Materials Science and Engineering POSTECH, Korea

1991. B.S., Materials Science and Engineering POSTECH, Korea

### Experience

2016-present: GIFT, POSTECH, Professor

2010-2015: GIFT, POSTECH, Associate Professor

2006-2009: GIFT, POSTECH, Research Associate Professor

2000-2006: GSIST/GIFT,POSTECH, Research Assistant Professor

1998-2000: Dept. of MSE, Carnegie Mellon Univ. Postdoctoral Research Associate

### Specialty

- Reaction Equilibria on Ironmaking and Steelmaking
- Reaction Kinetics on Ironmaking and Steelmaking
- Application of Physical Chemistry to Refining Processes in Ferrous Technology
- Development of advanced characterization and microanalysis of ferrous materials and related nonmetallic materials
- Development of Standard Reference Materials for accurate analysis of ferrous materials





**Youn-Bae Kang, Ph.D.**  
Associate Professor

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🌐 sites.google.com/site/cslgiftpostech/

#### Education

2005. Ph.D., Materials Science and Engineering, POSTECH, Korea  
2000. M.S., Materials Science and Engineering, POSTECH, Korea  
1998. B.S., Materials Science and Engineering, POSTECH, Korea

#### Experience

2009-present: Assistant, Associate Professor, GIFT, POSTECH  
2011: Visiting Researcher, Technical Research Laboratories, POSCO  
2005-2009: Post-Doc., Research Associate, CRCT, Dept. de G<sup>n</sup>ie Chimique, École Polytechnique de Montréal, Canada

#### Specialty

- Development of novel refining process of steel
- Tramp elements refining for scrap recycling
- Refining and alloy phase equilibria for high alloyed steel
- Clean steel production
- Physicochemical properties of molten steel and slag
- Solution modeling and thermodynamic database development - CALPHAD



**Sung-Joon Kim, Ph.D.**  
Professor, Director of MD Center  
NAEK

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🌐 http://ssteel.postech.ac.kr

#### Education

1990. Ph.D., Materials Science and Engineering, University of Illinois at Urbana-Champaign, USA  
1982. M.S., Materials Science and Engineering, KAIST, Korea  
1980. B.S., Metallurgical Engineering, Seoul National University, Korea

#### Experience

2011-Present: Professor, Director of Materials Development Center, GIFT, POSTECH  
2009-2011: Vice President, KIMS (Korea Institute of Mater. Sci.)  
1990-2011: Sr. & Principal Researcher, KIMS  
2009-2015: Member, National Science & Technology Committee  
2006-Present: Member, National Academy of Engineering, Korea

#### Specialty

- Alloy design and characterization of stainless steels
- Relation between microstructure and properties of high strength automotive steels
- Development of medium Mn high strength steels



**Nack Joon Kim, Ph.D.**  
Professor  
FASM

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🌐 https://mcl.postech.ac.kr

#### Education

1981. Ph.D., Materials Science University of California, Berkeley, CA, USA  
1977. M.S., Metallurgical Engineering Seoul National University, Korea  
1975. B.S., Metallurgical Engineering Seoul National University, Korea

#### Experience

2012-Present: Editor, Scripta Materialia  
2010: President, Korean Institute of Metals and Materials  
2009-Present: Professor, Microstructure Control Laboratory, GIFT, POSTECH  
2003-2006: Seah Chair Professor (1st Chair Professor at POSTECH)  
2002-2003: Visiting Scholar, Naval Air Warfare Center, USA  
1994-2003: Director, Center for Advanced Aerospace Materials, (National Engineering Research Center of Excellence consisting of 20 faculty and 200 staffs from 17 Universities)  
1989-2009: Professor, Dept. of Materials Science and Engineering, POSTECH  
1985-1989: Group Leader, Metals and Ceramics Laboratory, Allied Signal Inc., Morristown, NJ, USA  
1982-1984: Assistant Professor of Materials Science, University of Wyoming, Laramie, WY, USA  
1981-1982: Postdoctoral Research Associate, Lawrence Berkeley Laboratory, Berkeley, CA, USA  
1981-1982: Postdoctoral Research Associate, Lawrence Berkeley Laboratory, Berkeley, CA, USA

#### Specialty

- Alloy Design: Mg alloys, Amorphous alloys, Steel.
- Phase Transformation
- Electron Microscopy
- Electron Microscopy



**Yang Mo Koo, Ph.D.**  
Professor

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#### Education

1986. Ph.D., Materials Science, Northwestern University, USA  
1980. M.S., Materials Science, KAIST, Korea  
1978. B.S., Materials Science, Seoul National University, Korea

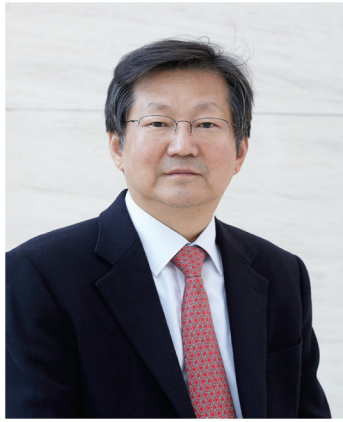
#### Experience

2007-Present: Director of Alternative Technology Laboratory, GIFT, POSTECH  
1997-Present: Professor, Materials Science and Engineering, POSTECH  
1995-1995: Visiting Scientist, Lawrence Berkeley National Laboratory  
1993-1995: Technical Director of Hyundai Heavy Industry  
1991-1997: Associate Professor, Materials Science and Engineering, POSTECH  
1987-1994: Magnet Group Leader, Pohang Accelerator Laboratory, POSTECH  
1987-1991: Assistant Professor, Materials Science and Engineering, POSTECH  
1986-1987: Post-doctorial Researcher, Materials Science, Northwestern University  
1983-1986: Research Associate, Materials Science, Northwestern University  
1980-1983: Assistant Professor, Metallurgical Engineering, Yeoungnam University

#### Specialty

- SR X-ray analysis of dislocation structure
- Grazing incidence diffraction analysis of thin film
- X-ray scattering and EXAFS analyses of multilayer SR-TXRF
- A study of internal residual stress of plastic deformation
- Magnet design and fabrication of the PLS 2GeV
- Synchrotron accelerator
- Magneto-optical Property of Co/Pd Superlattice
- Development of LIGA process in micromachine



**Chong Soo Lee, Ph.D.**

Professor  
NAEK

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🌐 <http://csleelab.com/>

**Education**

1984. Ph.D., Polytechnic Institute of New York University, USA  
1981. M.S., Seoul National University, Korea  
1979. B.S., Seoul National University, Korea

**Experience**

2012-present: Professor, GIFT, POSTECH  
2016: President of The Korean Institute of Metals and Materials  
2012-2016: Dean of GIFT, POSTECH  
2014-present: Member, Korean Academy of Science and Technology(KAST)  
2012-Present: Member, National Academy of Engineering of Korea (NAEK)  
2009-Present: Member, European Academy of Science (EAS)  
2012-2015: Editor-in-Chief, Korean Journal of Metals and Materials  
2004-Present: Editorial Board Member, International Journal of Fatigue  
2010: President, The Korean Society for Technology of Plasticity  
2003-2008: Director, National Research Lab (Fatigue and Plasticity Lab)  
1998-Present: Professor, Dept. of Materials Science and Engineering, POSTECH  
1999-2000: Visiting Professor, MIT  
1992-1993: Visiting Professor, UCLA  
1991-1998: Associate Professor, Dept. of Materials Science and Engineering, POSTECH  
1987-1991: Assistant Professor, Dept. of Materials Science and Engineering, POSTECH  
1985-1987: Postdoctoral Research Associate, Univ. of Minnesota

**Specialty**

- Fatigue behavior of Steel, Ti and Mg alloys
- Formability of structural materials
- Hydrogen embrittlement of high strength steels

**Dong Woo Suh, Ph.D.**

Associate Professor  
Director of RFC

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☎ +82 (0)54 279 9030  
🌐 <http://cml.postech.ac.kr>

**Education**

2000. Ph.D., Metallurgical Engineering, Seoul National University, Korea  
1995. M.S., Metallurgical Engineering, Seoul National University, Korea  
1993. B.S., Metallurgical Engineering, Seoul National University, Korea

**Experience**

2013-Present: Associate Professor, GIFT, POSTECH  
2010-2013: Assistant Professor, GIFT, POSTECH  
2009-2010: Research Professor, GIFT, POSTECH  
2003-2009: Senior Researcher, Structural Materials Division, Korea Institute of Materials Science, Changwon, Korea  
2002-2002: Researcher, Technical Research Laboratories, POSCO, Pohang, Korea  
2001-2002: STA Fellow, National Institute for Materials Science, Tsukuba, Japan  
2000-2001: Post-Doctoral Fellow, Research Institute of Advanced Materials, Seoul National University, Korea  
1995- 2000: Teaching Assistant, Department of Materials Science & Engineering, Seoul National University, Korea

**Specialty**

- Phase transformations in ferrous alloys
- Alloy design and microstructure control for higher performance steels
- Degradation of ferrous alloys in non-friendly environment

**Chang Hee Yim, Ph.D.**

Professor  
Dean of GIFT

✉ chyim@postech.ac.kr  
☎ + 82 (0)54 279 9001, 9010  
🌐 <http://ctlab.postech.ac.kr>

**Distinguished  
Visiting Professor**

**Education**

1986. Ph.D., Metallurgical Engineering, Seoul National University  
1982. M.S., Metallurgical Engineering, Seoul National University  
1980. B.S., Metallurgical Engineering, Seoul National University

**Experience**

2016-Present : GIFT, POSTECH, Professor, Dean of GIFT  
2014-2016 : Managing Director of POSCO Europe Office (Executive Vice President)  
2011-2014 : General Superintendent of Gwangyang Research Laboratories (Senior Vice President)  
2010-2011 : Research Fellow (Senior Vice President)  
2004-2010 : Senior Principal Researcher, Steel Making Research Group, Research Laboratories, POSCO  
2001-2004 : Group Manager, Steel making research Group, Research Laboratories, POSCO  
1986-1996 : Researcher, Research Laboratories, POSCO

**Specialty**

- Development of continuous casting tech
- Hot ductility behavior of carbon steel
- Center segregation control
- Solidification

**Harshad Kumar Dharamshi  
Hansraj BHADESHIA, Ph.D.**

Distinguished Visiting Professor

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☎ +82 (0)54 279 9021  
🌐 <http://cml.postech.ac.kr>

**Education**

1979. Ph.D., Materials Science and Metallurgy, University of Cambridge, UK  
1975. B.S., Materials Science and Metallurgy, City of London Polytechnic, UK

**Experience**

2010-2013: Wuhan University of Science & Technology, Consulting Professor  
2009-Present: SKF Steel Technology Centre, Cambridge, Director  
2008-2010: IIT Kharagpur, Distinguished Professor  
2008-Present: Tata Steel, Professor of Metallurgy  
2005-Present: Distinguished Professor, GIFT, POSTECH  
1999-2008: University of Cambridge, Professor of Physical Metallurgy  
1996-1997: University of Cambridge, Royal Society Leverhulme Trust Senior Research Fellow  
1994-1999: University of Cambridge, Reader in Physical Metallurgy  
1981-1986: University of Cambridge, University Demonstrator  
1979-1981: University of Cambridge, Science Research Council Research Fellow

**Specialty**

- Phase transformations: iron and its alloys, solid-state phase transformation theory, experimental validation, inventing new alloys and processes
- Theory of transformations: nucleation and growth, kinetic theory to define non-equilibrium states
- Mathematical models: computer models for the theory and empirical observations



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Research Professor

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**Education**

1993. Ph.D., Metallurgical Engineering, Seoul National University, Korea

1985. M.S., Metallurgical Engineering, Seoul National University, Korea

1983. B.S., Metallurgical Engineering, Seoul National University, Korea

**Experience**

2015-Present: Research Professor, GIFT, POSTECH

2012-2014: Research Associate Professor, GIFT, POSTECH

1997-2012: Senior researcher, Korea Electric Power Research Institute (KEPRI)

1996-1997: Junior researcher, KIST

1993-1996: Post-doctoral Associate, MIT

**Specialty**

- Theory of interfacial segregation in solid states
- Correlation between interfacial segregation of impurities and mechanical and/or electromagnetic properties
- Alloy design of heat resistant alloys and the mechanical properties
- Intergranular cracking mechanism in heat resistant alloys
- Creep mechanism and the life expectation in heat resistant alloys
- Development of oriented and non-oriented silicon steels including {110}<001> and {100}<0vw>
- Mechanism of surface-energy-induced selective growth in silicon steels
- Nucleation mechanism in deformed silicon steels

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Research Assistant Professor

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**Education**

2007. Ph.D., (The Integrated M.S./Ph.D. course), Materials Science and Engineering, Seoul National University, Korea.

2000. B.S., Materials Science and Engineering, Sung Kyun Kwan University, Korea.

**Experience**

2010-Present: Research Assistant Professor, GIFT, POSTECH.

2008-2010: Post-Doctoral Researcher, High Voltage Electron Microscopy Station, National Institute for Materials Science, Japan.

2007-2008: Post-Doctoral Researcher, Department of Materials Science and Engineering, SNU.

**Specialty**

- Transmission Electron Microscopy (Microstructure characterization)
- Maraging steel (Fracture behavior and Grain boundary precipitation)
- Phase transformation (Displacive -diffusional transformation, Order-disorder transition)
- Ultrafine grained steel

**Hansoo Kim, Ph.D.**

Research Associate Professor

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**Education**

2002. Ph.D., Materials Science and Engineering, POSTECH, Korea

1998. M.S., Materials Science and Engineering, POSTECH, Korea

1996. B.S., Materials Science and Engineering, Yonsei University, Korea

**Experience**

2015-Present: Research Associate Professor, Microstructure Control Lab., GIFT, POSTECH, Korea

2006-2015: Research Assistant Professor, GIFT, POSTECH

2005-2006: Research Associate, Eco-materials Center, National Institute for Materials Science, Japan

2003-2005: Research Associate, Steel Research Center, National Institute for Materials Science, Japan

2002-2003: Post-doctoral research fellow, Dept. of Materials Science and Engineering, POSTECH, Korea

**Specialty**

- Low-density Steels
- Novel Ferrous-alloy Design
- Physical Metallurgy of Steels

**Jae Kwan Kim, Ph.D.**

Research Professor

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**Education**

1986.4~1990.7 : Ph.D., Majored in Material Science Engineering, Tohoku University, Japan

1979.3~1981.2 : M.S., Majored in Physical Metallurgy, Busan National University, Korea

1975.3~1979.2 : B.S., Majored in Metallurgical Engineering, Pusan National University, Korea

**Experience**

2014.04~Present Research Professor, GIFT, POSTECH

2011.02~2014.03 Senior Vice President (POSCO Research Fellow / POSEEV Research Project Team Leader and Owner of High Functional Electrical Steel Development Big-Y)

2008.11~2011.02 EM-ES Research Project Team Leader (Vice President: '10.2~)

2004.03~2008.10 Group Leader, Electrical Steel Research Group (POSCO Technical Research Labs)

2001.03~2004.03 Team Leader, Electrical Steel Research Team (POSCO Technical Research Labs)

1998.01~2001.03 Senior Researcher, Electrical Steel Research Team (POSCO Technical Research Labs)

1994.09~1997.12 Senior Researcher, POSCO Tokyo Research Labs. (In charge of Electrical Steel)

1990.09~1994.09 Joining RIST (Electrical Steel Research Team), Senior Researcher

1982.11~1990.08 Joining POSCO (Electrical Steel Research Group of Technical Research Laboratories)

**Specialty**

- Development of Products and Manufacturing Process Technology in Fe-Si Steel Field.
- Alloy Design of Grain Oriented and Non-Oriented Electrical Steels
- Development of Manufacturing Process of Grain Oriented and Non-Oriented Electrical Steels
- Development of Magnetic Domain Refinement Technology and Domain Refining Equipments
- Correlation among Precipitation, Recrystallization, Abnormal Grain Growth, Texture, Surface Properties, Manufacturing Process Conditions in Electrical Steel Production Technology
- Application Technologies of Grain Oriented and Non-Oriented Electrical Steels
- Magnetic Properties and Thermal Stability of Amorphous Iron-Rare Earth Metal-Boron Alloys





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#### Education

2008. Ph.D., Ecole Nationale Supérieure d'Arts et Métiers (ENSAM), France  
2004. M.S., Aerospace Engineering, California State University, Long Beach, USA  
1998. B.S., Mechanical Engineering, Korea University, Korea

#### Experience

2016-present: Research Associate Professor, GIFT, POSTECH  
2014-2016: Research Assistant Professor, GIFT, POSTECH  
2011-2014: Senior Researcher, GIFT, POSTECH  
2010-2011: Postdoctoral Researcher, Ecole Nationale Supérieure des Mines, Saint-Etienne, France  
2008-2009: Postdoctoral Researcher, Ecole Nationale Supérieure d'Arts et Métiers (ENSAM), France  
1998-2000: Assistant Manager, Korea Aerospace Industries, Ltd., Korea

#### Specialty

- Characterization of the mechanical behavior of materials and structures using full-field optical measurements and inverse problems
- Identification of constitutive parameters from mechanical tests
- Characterization of dynamic strain hardening behavior using a high speed camera
- Characterization of thermo-mechanical behavior using an infrared camera



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#### Education

1990: Dr.-Ing., RWTH Aachen, Germany  
1985: M.S., Metallurgical Engineering, Korea University, Korea  
1983. B.S., Metallurgical Engineering, Korea University, Korea

#### Experience

2015-Present: Research Professor, GIFT, POSTECH, Korea  
2009-2014: Team leader of Hydrogen reduction project team, POSCO, Korea  
2004-2009: Group leader of ironmaking research group, POSCO  
2003-2004: Team leader of coal research team, POSCO  
2003-2003: Team leader of coal briquette research team, POSCO  
2001-2002: Team leader of Gwangyang ironmaking research team, POSCO  
1994-2000: Senior researcher, ironmaking research department, POSCO  
1991-1994: Researcher, smelting reduction research team, RIST, Korea  
1989-1990: Research for Ruhr Kohle A.G., Germany  
1986-1988: Research for Deutsche Forschungsgemeinschaft, Germany  
1986-1991: Researcher, Institute of Ironmaking, RWTH Aachen, Germany

#### Specialty

- Hydrogen reduction of iron ore
- Pulverized coal injection to blast furnaces
- Process optimization of blast furnace ironmaking
- Technology development of new ironmaking process
- Coke making technology
- Coal utilization in ironmaking



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#### Education

2001. Ph.D., Physics, POSTECH, Korea  
1997. M.S., Physics, POSTECH, Korea  
1995. B.S., Physics, POSTECH, Korea

#### Experience

2007-Present: Research Assistant/Associate Professor, Alternative Technology Laboratory, GIFT, POSTECH  
2005-2007: Research Assistant Professor, Department of Chemistry and Physics, POSTECH  
2003-2005: Research Fellow, Department of Physics, Uppsala University, SWEDEN  
2002-2003: JST Research Fellow, Computational Materials Science Center, NIMS, JAPAN  
2001-2002: Research Fellow, Department of Physics, POSTECH

#### Specialty

- Electronic Structure Theory
- Magnetism
- Surfaces and Interface Phenomena
- Intermetallic Alloy Properties



**Jae Sang Lee, PhD**  
Research Associate Professor

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#### Education

1998. Ph.D., Metallurgical Engineering, Seoul National University, Korea  
1993. M.S., Metallurgical Engineering, Seoul National University, Korea  
1991. B.S., Metallurgical Engineering, Seoul National University, Korea

#### Experience

2007-Present : Associate Research Professor, GIFT, POSTECH  
2006-2007: Director, Expresslab Co., Ltd, Korea  
1999-2006: Researcher, Senior Researcher, Plate Research Group, POSCO  
1998-1999: Visiting Researcher, Department of Metallurgy, The University of Tokyo, Japan  
1991-1992: Research Assistant, Special Alloy Research Laboratory, KIST, Korea

#### Specialty

- Thermo-Mechanical Processing of Alloys
- Numerical Simulation of Phase Transformations and Microstructure Evolution





**Jong Myung Park, Ph.D.**

Research Professor

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#### Education

1990. Ph.D., Polymer Science and Engineering, Lehigh University, USA  
1981. M.S., Polymer Chemistry, KAIST, Korea  
1979. B.S., Industrial Chemistry, Seoul National University, Korea

#### Experience

2013-Present: Research Professor, GIFT, POSTECH  
2007-2012: Associate Research Professor, GIFT, POSTECH  
2005-2007: Adjunct Professor, Division of Applied Chemical Engineering in Pukyong National University  
2004-2007: Managing Director of Polymer Research Institute, Buhmwoo Institute of Technology  
1979-2004: Technical Director of Central Research Institute of KCC (Korea Chemical Co., Ltd.)

#### Specialty

- Polymer synthesis, polymer crosslinking, polymer and coating characterization
- Film formation, emulsion polymerization
- Morphology control of sub-micron sized polymer particles
- Rheology control of coatings, electrodeposition coatings, coil coatings, automotive coatings, corrosion control by environmentally friendly coatings
- Surface treatment for steel alloys



**Sang Chul Won, Ph.D.**

Research Professor, Professor Emeritus

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#### Education

1985. Ph.D., Electrical Engineering University of Iowa, USA  
1976. M.S., Electrical Engineering, Seoul National University, Korea  
1974. B.S., Electrical Engineering, Seoul National University, Korea

#### Experience

2014-2016: Asian Control Association, President  
2012-2014: Asian Control Association, President Elect  
2011: Institute of Control, Robotics and Systems, President  
2009: Osaka University, Japan, Visiting Professor  
2006-2012: Asian Control Association, Vice President  
2005: Helsinki University of Technology, Finland, Visiting Professor  
1995-2016: Steel Processing Automation Research Center (SPARC), Director  
1995-2016: Professor, GIFT, POSTECH, Director of Clean & Green Technology Center  
1985-1987: University of New Haven, USA, Assistant Professor  
1985: University of Iowa, USA, Visiting Assistant Professor

#### Specialty

- Linear and nonlinear control system
- Steel Process control and Automation
- Robot motion control
- Dynamic system modeling and simulation
- Energy conversion

#### Affiliate Faculty



**Wolfgang Bleck**

1979 Ph.D., Clausthal University of Technology, Germany  
Professor, RWTH Aachen, Germany  
1979. B.S., Industrial Chemistry, Seoul National University, Korea



**Nirupam Chakraborti**

1983 Ph.D., University of Washington, USA  
Professor, Indian Institute of Technology Kharagpur, India



**Se-Ho Choi**

2001 Ph.D., University of Sheffield, UK  
Senior Principal Researcher, POSCO, Korea



**Yuri Estrin**

1975 Ph.D., Institute of Crystallography, Academy of Sciences of USSR, Soviet Union  
Professor, Monash University and CSIRO, Melbourne, Australia



**Kazuhiro Hono**

1988 Ph.D., The Pennsylvania State University, USA  
Profeffor, National Institute for Materials Science (NIMS), Japan



**Toshihiko Kuwabara**

1987 Ph.D., Tokyo Institute of Technology, Japan  
Professor, Tokyo University of Agriculture and Technology(TUAT), Japan



**Myoung-Gyu Lee**

2004 Ph.D., Seoul National University, Korea  
Professor, Korea University, Korea



**John G. Speer**

1983 Ph.D., University of Oxford, UK  
Professor, Colorado School of Mines, USA



**Xinhua Wang**

1986 Ph.D., University of Science and Technology Beijing(USTB), China  
Professor, USTB, China



**Jer-Ren Yang**

1987 Ph.D., University of Cambridge, UK  
Professor, National Taiwan University, Taiwan

#### Professor Emeritus



**Kyoo Young Kim**

1981 Ph.D., University of Connecticut, USA  
1986-2012 at POSTECH



**Hae Geon Lee**

1983 Ph.D., University of Washington, USA  
1997-2011 at POSTECH

#### Retired Faculty



**Henri Gaye**

1971 Ph.D., Carnegie-Mellon University, USA  
2005-2008 at GIFT



**Yasushi Sasaki**

1977 Ph.D., The University of Tokyo, Japan  
2007-2012 at POSTECH



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## Student's Life (Clubs)

### Wine Class

Wine, a fascinating world full of aroma and taste!

Many people are attracted to the world of wines. They may, however, encounter difficulties soon because there are only a few systematic ways to approach the world of wines. The Graduate Institute of Ferrous Technology (GIFT) provides monthly classes during regular semester periods to help such people study the wine in detail with a supervisor and an organizer. That is the GIFT Wine Class.

The GIFT Wine Class was proposed by Prof. Henry Gaye, who wanted to introduce and spread the beauty of wine, and many people in GIFT were willing to participate in the activity. The class began in 2006, just after GIFT was founded, and the Wine Class has been held regularly since then.

The Wine Class is mainly organized by two people; a supervisor and an organizer. A supervisor is a person with lots of experience and knowledge about wines, enough to give a lecture to the participants. He/She generally selects the region where the wine comes from. Then an organizer prepares various wines from the selected region, the side dishes, and joyful music. The supervisor gives lecture about the selected region and wines at the beginning of each class, and after the short lecture the organizer serves the participants the wines and snacks.



The main purpose of the GIFT Wine Class is to provide the guidelines and fundamental knowledge to enable its participants to select appropriate wines under their own situations. Therefore, various wines from a specific region are selected for each class as references. For comparison, two or three wines made from the selected region are prepared for every classes. Participants can taste the wine during the class. Also, they learn the essential etiquette required when drinking and serving wine.

A supervisor for the Wine Class is generally selected from faculty and one of the students takes the role of the organizer. The term of a supervisor depends on the will of the professor. Unless there is an arrangement, the term will be automatically renewed. The organizer is a one-year position, and the person can serve for another year under the agreement with other members.

Currently, Prof. Frederic Barlat, who has a wide and profound knowledge of wines, is in charge of Wine Class supervisor. Despite his busy schedule all year round, he puts his passion into the GIFT Wine Class and he leads the class with his own pleasant character.

The GIFT Wine Class is a month-long class. All GIFT members need not to be wine experts, but the GIFT Wine Classes certainly do provide GIFT members opportunities to obtain knowledge on wines and enjoy good wines with good people.

### Ruder's Band (musical band)

Many people could recognize a masterpiece, but only a few people can make a masterpiece.

Such cases can be found not only with painting but also in the field of music. There are many people who are interested in music and eager to play, but many of them fill their love for music just with listening, which is still a good way to enjoy the music. However, it would be much better and enjoyable if he/she has experienced the joy of performance.

The GIFT Band was founded by such people who have a degree of performance experience. During their undergraduate years, they played a guitar, bass, drum or keyboard as a member of a band. When they finished their undergraduate programs and started the graduate program, they had to leave their bands. As most of them wanted to continue playing, it became more difficult as time went by because of their busy schedules with their studies. Here at GIFT, people who want to play music can have a chance to practice and play. Electronic drums, amplifiers for guitars, and keyboards are available to the band, provided by GIFT. Also, the main auditorium with sound-proofing and an air-conditioning system is open for general practice. Ruder's Band is open to everyone at GIFT.



### GIFT Futs (soccer club)

Do you remember the year 2002 when Korea co-hosted the FIFA World Cup? Many will agree that the FIFA World Cup is one of the most exciting sports events in the world. GIFT has a soccer team whose name is GIFT Futsal Club (GIFuts). Although it is called the GIFT Futsal Club, we do not just play Futsal but also football at the main soccer ground. And of course our soccer team is always open to GIFT. So, do not hesitate to check out a Futsal game, which usually takes place once a week at the well-designed Futsal ground. Moreover, we also play in a league, which usually starts during summer breaks or in the fall. Around twenty teams at POSTECH play in this league. Frankly speaking, the score of our team in the league was not very good last year since it was our first time in the league. However, if you attended our soccer team, we would become much better. Someone who is worried about their ability in playing soccer, I can simply say, "NO WORRIES". We always welcome GIFT students who have strong passion for soccer. So, again do not hesitate!

Just come and see how you can improve our team!





## How to get to GIFT at POSTECH

GIFT is in Pohang, a city in North Gyeongsang Province, on the southeast coast of South Korea. Visitors will first arrive at Seoul/Incheon International Airport in Incheon, or at Gimhae International Airport in Pusan. Several ways can be used to get the rest of the way.

### From Incheon

#### By Air:

Transfer to Gimpo domestic airport by airport limousine bus (number 6003, 6008, 6014, or 6101).

Airplanes from Gimpo to Pohang depart twice a day: at 8:40 am from Tuesday to Sunday, at 7:50 am on Monday, and at 5:00 pm every day. The flight takes 50 minutes; a one-way trip costs ₩69,000~₩89,000 (~ US\$ 64 ~ 80). To get to GIFT, take a taxi (~30 min; ₩13,000).

#### By train:

The direct KTX train from Incheon International Airport to Pohang departs once a day at 12:07pm. The trip takes about 3.5 hours; a one-way trip costs ₩64,900.

At other times, to take the KTX, you must first move to Seoul Station on the airport high speed railroad train or the airport limousine bus, and take a KTX train bound for Pohang there. KTX trains from Seoul to Pohang depart 8~10 times a day, from 5:15 am to 10:10 pm. The trip takes about 2.5 hours and costs ₩52,600.

In both cases, the final stage from Pohang station to GIFT is a taxi ride (20 min, ₩10,000).

#### By Bus:

An express bus to Pohang leaves platform 10C at Incheon International Airport every 2 to 4 hours from 7:00 am to 9:30 pm. The bus stops at Gyeongju Express Bus Terminal before it reaches its final destination, Pohang, so be sure not to get off at the wrong stop. The trip takes 5 hours; a one-way trip costs ₩44,300. Note that otherwise, the bus stops only once and has no toilet.

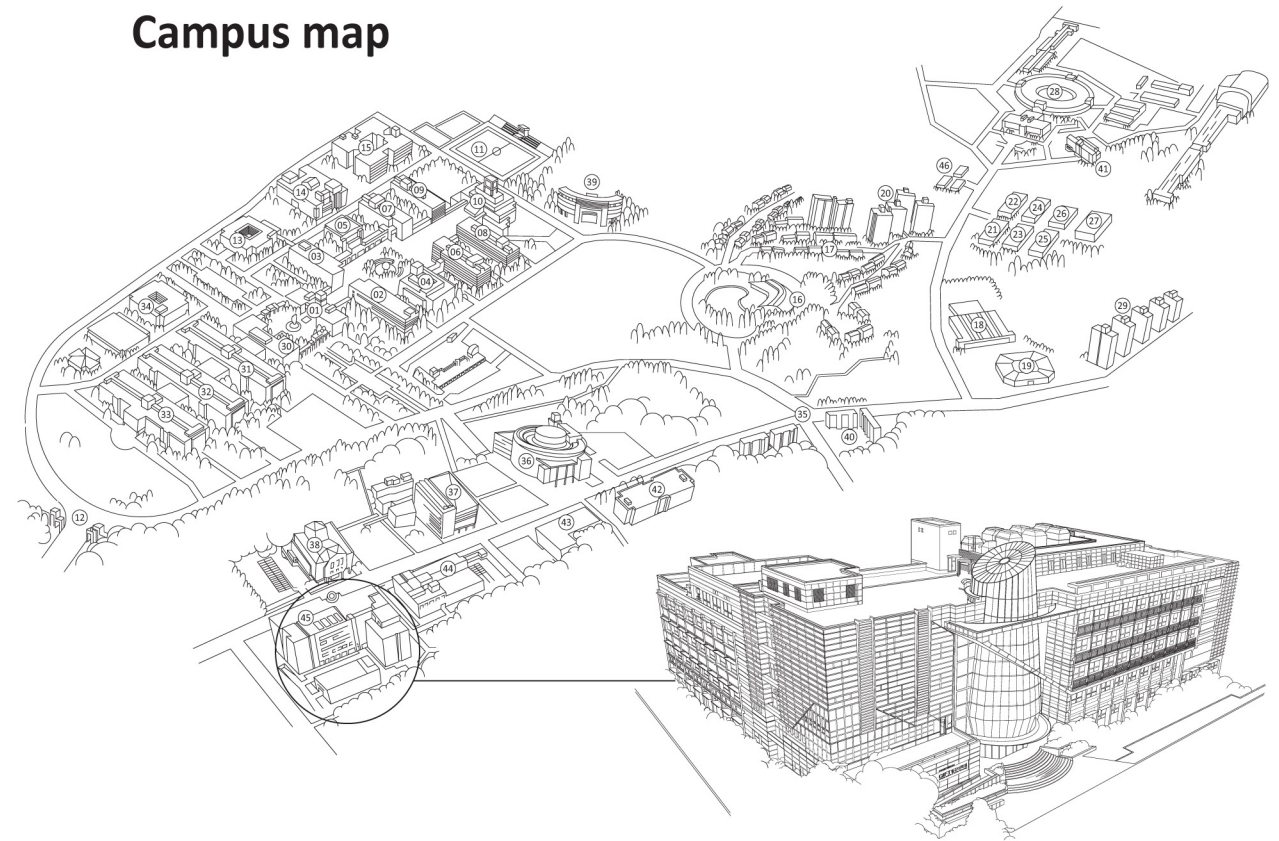
An alternative is to go to Seoul Express Bus Terminal (Gangnam) by airport limousine bus, and take an express bus bound for Pohang. This bus takes about 4.5 hours from Seoul to Pohang under normal traffic conditions. To get from the bus stop (Pohang City Hall) to GIFT take a taxi (10 min, ₩5,000).

The Express Bus departs three times a day, 7:30 am, 9:30 am and 5:30 pm. A one-way trip costs ₩21,400. The Premium Express Bus departs every 30 minutes from 6:00 am to 9:00 pm. A one-way trip costs ₩31,800. The Midnight Express Bus departs every hour from 10:00 pm to 12:30 am the next day. A one-way trip costs ₩34,900.

### From Pusan

An airport limousine bus departs Gimhae airport every hour from 7 am to 10 pm. The trip takes 2 hours and costs ₩11,000. From Pohang intercity bus terminal to GIFT, take a taxi (20 min, ₩10,000).

## Campus map



- 01 Administration Building
- 02 Science Building I
- 03 Mathematical Science Building
- 04 Hogil Kim Memorial Hall
- 05 Auditorium
- 06 Science Building II
- 07 Science Building III
- 08 Science Building IV
- 09 Science Building V
- 10 Student Union Building
- 11 Main Stadium
- 12 Main Gate
- 13 Information Research Laboratories
- 14 LG Cooperative Electronics Engineering
- 15 School of Environmental Engineering
- 16 Jigok Community Center
- 17 Student Dormitories
- 18 Gymnasium
- 19 POSPLEX
- 20 Graduate Student Apartments
- 21 Chemistry Building
- 22 Life Science Building
- 23 Industrial Engineering Laboratories Building

- 24 Machine Shop
- 25 Chemical Engineering Laboratories Building
- 26 Mechanical Engineering Laboratories Building
- 27 Wind Tunnels
- 28 Pohang Accelerator Laboratory
- 29 Faculty Apartments
- 30 RIST Administration Building
- 31 RIST Research Building I
- 32 RIST Research Building II
- 33 RIST Research Building III
- 34 RIST Research Building IV
- 35 East Gate
- 36 Tae-joon Park Digital Library
- 37 POSTECH Biotech Center
- 38 Pohang Institute of Intelligent Robotics
- 39 POSCO International Center
- 40 Posville Apartments
- 41 National Center for Nanomaterials Technology
- 42 C5
- 43 Jigok Research Building
- 44 Pohang institute of Metal Industry Advancement
- 45 Graduate Institute of Ferrous Technology (GIFT)**
- 46 POSCO/RIST Laboratories Bldg.

