

POSTECH GIFT

Graduate Institute of Ferrous Technology

Pohang University of Science and Technology
San 31 Hyoja-dong, Nam-gu, Pohang, 790-784, Korea
Phone: 82-54-279-4415~19 / Fax: 82-54-279-4499

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Quantum-Leap to The World's Best in Ferrous Technology

세계 유일의 철강전문 교육 연구기관 포스텍 철강대학원—
세계적 철강회사인 포스코와 전략적 파트너십을 맺은 철강대학원은
우수 철강인력 양성과 신기술 개발을 통해 철강 교육과 연구의 메카로 도약해 나갈 것입니다.



Design Concept of GIFT Building

The facade of the GIFT Building is designed to convey its research-oriented function by symbolizing a blast furnace, an anvil and bellows that had been utilized in steel production since ancient times.

The exterior walls are enclosed by steel and glass to add a modernized effect. The versatile use of steel is effectively shown with lines and curves at the facade of the laboratory building.

The building is designed in a bright and transparent mode so that it assimilates with the surrounding buildings: Tae-Joon Park Digital Library, POSTECH Biotech Center and Pohang Institute of Intelligent Robotics.

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Pohang university of Science and Technology
San 31 Hyoja-dong, Nam-gu, Pohang, 790-784, Korea
Phone: 82-54-279-4415~19 / Fax: 82-54-279-4499 / Email: gift-home@postech.ac.kr

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GIFT-A New Beginning for Steel, the Material of Endless Evolution



Steel is the feed stock for most industries and the backbone material of the society. Our everyday life is closely embraced by steel. Virtually everything around us contains steel, if not fully made of it. To take the fair role as a major contributor in the development of the society, science and technology of ferrous materials must continue to be advanced to create steel that nurtures an affluent eco-friendly society and contribute to the sustainable development of modern society. In this regard, it is essential that competitiveness of applied technology of the steel industry be improved and that the leading edge of basic research which sustains it must be secured.

It was with this in mind that POSTECH, a leading research oriented university in Korea, initiated a proactive program in which graduate students are inspired into a deeper understanding of ferrous metallurgy through appropriate teaching and research. This is the program which led to the foundation of the Graduate Institute of Ferrous Technology (GIFT) in 2005, a further prodigious expansion of the original goal outlined in 1995.

GIFT has a mission to act as a rich source of highly trained young scientists and technologists, not only to feed the ever growing demands of the steel producing and using

industries, but also to nurture creativity in this most fascinating materials. GIFT has an international perspective, with both staff and students welcomed anywhere in the world, and with no boundaries of research collaborations. The working language of all staff and students is English.

The institute is not only located in one of the best University environments in the world but also benefits from its close proximity to some of the major steel producers in Korea, including of course POSCO, who has generously funded GIFT in perpetuity.

The Institute carries a heavy responsibility of educating young people who will serve the steel-based industries of the future. This, of course, is the most valued output. Most of the research will be openly published in the usual culprit journals and conferences. GIFT itself will organize specialized workshops in areas where detailed literature is lacking and may publish textbooks as time permits.

GIFT develops links with steel producers and users on a global basis. The interaction can happen via many

mechanisms, including collaborative projects, workshops, participation in teaching, employment of highly-trained graduates, secondments from industry to conduct research at GIFT, group sponsored projects, etc. Such interactions are considered vital in the two-way transfer of knowledge, ideas and direction.

GIFT will continue to devote to accomplishing its missions: To nurture the best manpower in steel technology as *the Steel Academy of Excellence*, and to be the custodian of world steel research.

Lee, Hae Geon
Dean & Professor
GIFT, POSTECH

Lee, Hae-Geon

Dean, Professor of Clean Steel Lab,
Graduate Institute of Ferrous Technology (GIFT), POSTECH.

BSc Seoul National University
MS, Ph.D University of Washington

Bruno C. De Cooman

Professor & Director of Materials Design Lab,
Graduate Institute of Ferrous Technology (GIFT),
POSTECH.

B.Sc. Ghent University, Belgium,
Ph.D. Cornell University, USA.

Graduate Studies at GIFT

GRADUATE STUDIES AT GIFT

GIFT is a graduate institute, and its educational focus is on M.S. and Ph.D. degrees in steel and ferrous alloys technologies. The M.S. degree is a two year program of study, which includes a thesis research project. The Ph.D. program is a three to four year program with a strong emphasis on original research. In the course of both programs, M.S. and Ph.D. students go through a rigorous scientific and technical training in materials research, with a strong emphasis on

the science and technology of steel and ferrous alloys. Research and education at GIFT are focused on ferrous alloys fundamentals, industry-related technologies, and innovation in steel products design, application and processing. The MS and PhD thesis completed by GIFT students span the full range of research areas from technology-oriented research, with an emphasis on core industry research interests, to materials science-oriented research, with an emphasis on fundamentals.

FOCUS ON STEEL SCIENCE AND TECHNOLOGY IN GRADUATE RESEARCH

Teaching and graduate research at GIFT have a clear focus: steel and ferrous technology. The research, development and innovation are often driven by a strong industry interaction. GIFT provides basic research, on a long term basis, for strategic domains within ferrous technology. At GIFT, both masters and doctoral thesis research is often clearly technology-oriented, with an emphasis on industrial research interests. In contrast to most graduate programs related to materials science, GIFT has chosen for a very strong focus on both ferrous materials science fundamentals and advanced technologies, as it believes true innovations and the potential for a large research impact can only be made in these areas. By emphasizing scientific progress and technical innovation, GIFT aims to set the global agenda for future steel products and technology developments.

GLOBAL EXPERIENCE

GIFT offers a fully integrated English language graduate program. Coursework, research, reporting, etc are carried out in English, and the GIFT student has an opportunity to be international. In addition, GIFT students routinely carry out research at universities and institutions outside Korea for extended periods of time. This unique approach to graduate research allows for the development of effective communication, organizational, and international team-working skills which are an essential part of the GIFT learning experience.

EXCEPTIONAL LEARNING ENVIRONMENT

For graduate students, GIFT is a unique place to study and do research in that it offers more than just an advanced engineering diploma. The international dimension of an English program was mentioned earlier, but GIFT also offers an exceptional learning environment in many other ways. During their graduate studies, GIFT students

are given the opportunity to develop crucial professional skills. GIFT also seeks to give its MS and PhD students a rigorous scientific and technical training in materials research, coupled to a sense for innovation and originality in steel product and technology development. As many projects are completed in collaboration with the industry, the development of effective communication and organizational skills is also important. This is achieved through the preparation of project progress meetings, the participation to international conferences, and the writing of technical reports and journal publications. The GIFT experience allows its graduates to achieve leadership skills during their professional development.

ALL NEW COURSES

GIFT has a specialized expertise in steel-related education, and it is continuously developing and improving an already exceptional curriculum consisting of courses covering all the areas of steel research and technology. The rich GIFT curriculum offers courses in both traditional subjects and advanced ferrous materials science topics. In all cases the courses have been newly designed by academic and industry experts who are leaders in their field of research. Often, the approach is unique. For example the GIFT course on solidification is taught by an expert in phase field modeling. The courses devoted to steel products emphasize physical materials science principles. And ferrous alloy theory is taught by a physicist specializing in first principles calculations. Advanced courses on metal forming and steel processing will be added to the GIFT curriculum, further enriching an already unique offering of courses designed to support the research efforts of GIFT students.

Bruno C. De Cooman

Director & Professor of MDL,
GIFT, POSTECH.



My Daily Life in GIFT

As a foreign student, I have been enjoying the study and life in GIFT, POSTECH. World wide renowned professors and well-funded projects provide the students with an excellent study environment and research condition. The official language in GIFT is English, in other words, you can communicate in English with everyone in GIFT, even including all the staffs. I appreciate a nice international environment and different cultures co-existing in GIFT because the students and faculty in GIFT come from several different countries. Furthermore, the university, POSTECH, provides satisfactory food at a student cafeteria and a faculty and staff cafeteria and has calm and beautiful campus, convenient gymnasium, magnificent library, and so on. All the facilities I have mentioned above make my life easy and comfortable.

I want to introduce my everyday life to you to let you know the study and life in GIFT. On weekdays, from Mondays to Fridays, I usually wake up at 8:30 in the morning and have some bread, milk and fruits as my breakfast. Although I can have delicious meal from nearby cafeterias, it became my habit to have a light meal in my room. Afterwards, I arrive at the student office at about 9:10 or 9:20 and start my study or research in the student office or have a first class at 9:30. Luckily, all my classes are held in the same classroom, and it is conveniently located in a room right in front of my office. Every student is allocated with a separate desk and a new computer with excellent configuration in the student office. Therefore, I can read books, download papers, send e-mail, and program for calculation in the office. Sometimes, I do experiments in the laboratories

located in a separate building, and this keeps the office a quiet environment for studying. I usually have lunch with my lab members or Chinese friends from other departments at 12:00 in one of the cafeterias. However, the lunch time can be flexible because lunch is served from 11:30 am to 1:30 pm.

I also enjoy delicious beverages in the lounge, such as a fresh cup of coffee or quick instant coffee, green tea, red tea, and some other kinds of Korean traditional tea (I am sorry, but I do not know their exact names). When I finish my work of the day which is at about 5:30 pm, I enjoy my free time. I sometimes go to the gymnasium to play badminton, pingpong, or basketball. I also go to a supermarket to do some grocery or meet with my lab members or some other friends to have dinner or to drink together. If necessary, I also stay in my office to do more work after dinner.

A wonderful life can be enjoyed on Saturdays and

Sundays, too. Many students here regularly play basketball or soccer in the Saturday afternoon. POSTECH is located in Pohang, a seaside city; therefore, it is nice to occasionally visit some beaches not so far from our campus, about a half an hour bus ride.

An absolutely interesting activity in GIFT that is worth mentioning is the excellent "Wine Class" organized by Prof. Henri Gaye, who is French. It is held every two weeks. Another amazing activity for sports lovers is the soccer game. The GIFT Football Club gathers every Tuesday to play soccer together.

Ph.D student CML, GIFT, POSTECH
Yi, Hong Liang

Report of EBSD Conference 2007 in Scotland

Master program 1st year student
MDL_GIFT_POSTECH
Shin, Sun Mi



The Electron Back Scatter Diffraction Meeting 2007 was held in New Lanark, Scotland, from 26th to 28th of March, 2007. This meeting provided a forum for the EBSD users to discuss the most recent development, progress and innovations of EBSD applications and techniques. The first day of this meeting was the celebration of David Dingley's contributions to the development and application of EBSD and related techniques.

There were about 100 participants from different backgrounds (physics, earth sciences, and materials science). Soran, a post doctoral researcher in the Materials Design Laboratory, and I were the only participants from Korea.

This meeting was the first conference I attended since starting my M.S. research. Thanks to some knowledge I have obtained during the course of my research, I was able to understand other delegate's research area. The conference helped to think about future work and other aspects of my M.S. project. I think the conference was an opportunity to expand my knowledge and gain

some ideas from other participants who work on the similar research areas.

Most people in the meeting were professional and experts in their field. During the conference, Soran and I had several opportunities to meet the representatives from TSL-EBSD Company. We asked many curious things that had occurred during the analysis of our data, and they explained to us whatever we asked in detail. As my presentation time was approaching, I was not able to stop worrying because I was representing GIFT, POSTECH, and Korea. However, at that time I received a lot of support and encouragement from many people, so I could present our work with confidence. Some people showed an interest in our research, and we still stay in contact with them for discussion by email.

It was a piece of luck that I participated in the meeting. Three months before the conference, Soran gave me the information about it and helped me with the application process. We worked hard day and night to get good results. However, despite the every effort we made, we would not have gotten the opportunity to go to the meeting if it were not for the newly purchased TSL-EBSD system which had been recently set up in GIFT. The new TSL-EBSD system which is connected to ZEISS ULTRA-55 Field Emission Gun Scanning Electron Microscopy (FEG-SEM) in TICM was installed in February. Furthermore, Prof. de Cooman and Prof. Sam Kyu Chang advised us, and GIFT supported us to attend the conference. Therefore, I would like to give my appreciation to Soran, Prof. de Cooman, Prof. Samkyu Chang, and GIFT.

Training at Borckhaus, Germany

I went to Brockhaus, Germany with Sun Mi Shin and Se Il Lee last November for the training of a magnetic property measuring equipment, which we were involved in purchasing of the machine. From Frankfurt Airport, we had to go about three hours by car to reach Ludenschied, where the training was held.

Ludenschied was a small town, and I noticed that we were the only Asians there. It is located in the central part of Germany where a mountain range begins, so the temperature was pretty low and it was foggy a lot of time.

It was already late at night when we arrived in Ludenschied, so we began the training the next morning. The first day of the training was mainly focused on the international standards of the measurements of magnetic properties, for example, the Epstein frame or the single-sheet testing. We also learned about theoretical bases such as calculations done by software to obtain magnetic properties.

On the second day, we learned how to use the Epstein machine and a single-sheet test machine, as well as how to place the sample on the machine, how to set the sample data, and how to use different methods for measuring of non-

oriented electrical steel and grain-oriented electrical steel, etc.

On the third day, the company gave us a tour of Koln. We visited the Koln dome and a chocolate museum. Then on Thursday, we learned about the usage of other equipments, ring core and punched parts. The training was focused on how to use the machine and the concept of the correction factors. The training on the last day was just about the summary of what we learned then the training was completed. They gave us a book about Ludenschied as a souvenir.

After the training was finished, we went to Aachen and visited a dome, city hall and Aachen University. We also met Julia, who studies in Aachen University and was in GIFT as an exchange student last summer, and had breakfast together the next morning. Then we stopped by at Bonn for a short tour then went to Frankfurt for a night and came back to Korea the next morning.

It was my first time visit to Europe. Even though I was there for equipment training, it was a great experience, and I thank GIFT for it.

Master program 1st year student
MDL_GIFT_POSTECH
Park, Hee Yong



A Letter from Research at the Katholieke Universiteit Leuven



The Katholieke Universiteit Leuven, where I am currently posted as a visiting scholar, is located in a small city Leuven, Belgium. Most of you probably have never heard of the university as neither have I before coming here. Last December, one professor from Belgium visited GIFT to present a seminar on his research work related to non-metallic inclusions in steel. His name is Bart Blanpain. After the seminar, I approached him to discuss about my research topics. Fortunately, I was soon invited to his university with the help of Prof. Gaye and Prof. Blanpain.

Our department, GIFT, provides financial supports including travel expenses, housing fee and living expenses to any student who wishes to research abroad. In order to apply for it, one must have an invitation letter from a professor who is willing to supervise you in the hosting university.

I want to share my experience and give tips on how to live in Belgium. The most important thing, in my opinion, is accommodation. You have to confirm whether or not there is any available house. KUL (Katholieke Universiteit Leuven) has an accommodation office called Home Vesalius. It provides a guesthouse, i.e. studio, for single students. The rental fee is not as cheap as it is in

POSTECH. It costs about five hundred euros a month and is provided with electricity, water, bed sheets, towels and internet access. The email address of Home Vesalius, HomeVesalius@dsv.leuven.be, should be useful for someone who plans to visit here for a short period. You can ask people in the office about anything you want to know.

Secondly, if your length of stay is less than three months, you don't need visa. But you must register yourself as a student and as well as a foreigner in Leuven. Short term visiting scholars are asked to register as soon as possible upon their arrival. After the registration, you can access a library and internet in your home. The office generally opens in the morning from Mondays to Fridays, but keep in mind that it closes in the afternoon. In addition to the registration as a visiting scholar, you should go to Leuven City Hall to register as a foreigner. Visiting scholars are required to register at the Foreigners Office in the Leuven City Hall within eight days after registering as visiting scholars. Three copies of recently taken passport-sized photographs and a confirmation document of your address in Leuven are needed for the registration process. The confirmation document can be issued from the accommodation office.

Thirdly, you should open a bank account. You can easily open an account if you have the address confirmation issued from the city hall. I wish my story will help you, and I look forward to going back to GIFT and seeing you soon. Hopefully, I will get a chance to talk about it more with you.

Ph.D student CSL, GIFT, POSTECH
Kim, Hyun Soo

After Participating in The Corrosion Science Society of Korea



I had a chance to take part in the Corrosion Science Society of Korea for the first time since my admission to GIFT. I want to express my deep appreciation to my advisor, Professor Kyoo Young Kim for giving me the opportunity.

The Society was held in Busan for one day. Professors and graduate students from many universities in Korea participated and gave seminars on various topics in separate rooms. I had a choice to select some topics that I was interested in, and I carefully listened to the speakers. There were several lectures which were very interesting, so I approached the lecturers during a coffee break to discuss about their topics. It was very exciting to meet people whose research field was similar to mine and to hear their opinions. I was surprised to learn that although the corrosion study seemed to be a small concept but it had a wide range of applications.

There was good exchange of information and advice or suggestions that helped the participants in researching their own field. In addition, attending the seminars provided not only a good experience to check my understanding with others but also a good chance to listen to the opinions of other researchers. These were the great merits of participating in the conference; thus, I strongly recommend that you participate in various conferences as many times as possible.

I hope my essay will help you. Thank you.

Master program 1st year student
SEL, GIFT, POSTECH
Kim, Young Hyun

About the Future of Steel Industry

Q. To begin with, please tell us about your research areas and current activities you are engaged in?

My research goal is to obtain a sufficiently deep understanding of iron and its alloys, to be able to exercise creativity. Steels are difficult materials, and scientists love difficult problems.

Q. What made you decide to come to Korea (GIFT)?

My adventure in Korea is due to one person (HGL), who has the charm and honesty to convey the magnitude of the opportunities that lie ahead.

Q. Why did you choose GIFT and what are your impressions of the school.

Once I became associated with GIFT, mountains were moved to help me establish a fully staffed laboratory in a short space of time. We are left with no excuse to fail in research. GIFT is seriously exciting. I do wish, however, that students would routinely use English when communicating with each other. The level of spoken English needs to be dramatically improved. How many students, for example, think in English?

Q. What do your students expect when they come to study at GIFT?

It is hard to say what students expect when they join GIFT. There are a lot of material rewards, but some of them undoubtedly like our mission, i.e., to accomplish the best science in the world. Students, when they join, have no experience of the pain and ecstasies of real research. We shall have to wait and see how many become philosophers at the end of their time in GIFT.

Q. What might have you done if you had not been a scientist?

My choice of metallurgy as a career was made at the age of 16, in the U.K., after having to leave Kenya. If circumstances had been different, I had in mind to study medicine at a University in India. But I think I would have become bored.

Q. What is the best thing about working in GIFT?

For me, the best thing about GIFT is that it is an oasis of steels.

Q. How did you get interested in "Computational Metallurgy"?

I became interested in computational metallurgy by accident, when faced with complicated steels. The computers are merely tools, like microscopes. It is the perceived ability to solve complex metallurgical problems using computers that excites me.

Q. What will be the future of steel industry?

You ask me to comment on the future of the steel industry this is not a useful thing to do. Ash by in 1993 made a very poor and damaging prediction of the collapse of metals and the rise of ceramics. We now know that he was dramatically wrong, but in the process, his and other such predictions had a damaging effect on materials education, from which the world is still suffering. I do not therefore want to make a comment on the future of the steel industry. What I can say is that the future of the industry can be guaranteed by good management and the nurturing of young metallurgists.

Harry Bhadeshia

Director, Adjunct Professor of Computational Metallurgy Lab,
Graduate Institute of Ferrous Technology (GIFT), POSTECH.

Professor of Physical Metallurgy,
University of Cambridge, UK

BSc City of London Polytechnic 1976
PhD University of Cambridge 1979

Interview with Prof. Harry Bhadeshia

Summer Internship Program Participant from India

Welcome to GIFT, POSTECH

Undergraduate Student,
Indian Institute of Technology,
Kharagpur, India

Rohit Ojha



I had very little knowledge about GIFT before the esteemed faculty visited my campus this year. The sessions were very informative and created an interest in me to pursue my summer internship here and explore a whole new world of ferrous technology. I came to know about my selection just before my semester examinations. I had a hard time getting the Visa but the cooperation of the GIFT administrative staff was commendable. The internship period is of 8 weeks, 14th May- 6th July 2007.

It was on 13th May that I flew from India along with four other students from different institutes of India. My stay at POSTECH has been a wonderful experience till now. We got excellent accommodation at the Faculty Guest Rooms. Walking through the beautiful campus of POSTECH the very next day promised me that the next 8 weeks that I was going to spend here are definitely to be the best days of my life till now.

I had been appointed in Surface Engineering Lab under the guidance of Prof. K. Y. Kim. I met all my group members that day, and found them to be very friendly and supportive. They also gave me a welcome party. Soon, I realized that I was not on a holiday but to learn here. I attended classes from the same day and started working in the laboratories from the next day.

Other than very good academics, the stay at GIFT has been a lot of fun. One of the most unique experiences was the wine class conducted by Prof. Henri Gaye. I even had the chance to see the annual festival and a rock concert. We spent weekends visiting Busan, Gyeongju and places in and around Pohang. The beaches were fun and the temples gave an insight of Korean culture. This is my first experience overseas and I am very glad that it has been a very good one.

GIFT provides a very good environment for education and research. There is a plethora of opportunities for the students here, and they can really carry out some genuine research work.

Business Trip to CSIRO in Australia



After the weekend, we went to the CSIRO mineral, located in Clayton near the Monash University. CSIRO is one of the biggest research centers in Australia. We met Sharif Jahanshahi, program manager of high temperature processing part, Ling Zhang and Shouyi, research scientists of CSIRO. We discussed about the present research status, research skill and future research works as a whole. During the four-day intensive workshop, we learned the basic and advanced usage of MPE and understood the principles of MPE, which enables the prediction of gas and solid, slag refractory, inclusion engineering and steel making reaction. Through the workshop, we also evaluated the performance of MPE with real measured data about the desulphurization process as a case study. We also shared experiment results and experimental tips while visiting the laboratories and demo-plant in CSIRO. After the entire schedule was finished, we discussed about the promising work area and the possibility of research collaboration and academic exchange between GIFT and CSIRO. They were really cooperative with us, so we could learn many things and enjoy our stay.

This business trip was a fully beneficial and a worthy experience for me, not only for learning MPE program and thermodynamic knowledge but also experiencing other research center's interests and groping the possibility of the cooperation between GIFT and CSIRO.

Steel processing in the ladle is generally performed in 30 to 40 minutes at a temperature range of 1500 °C. Even though the processing time is not very long, the reaction goes to near equilibrium because of high temperature, so it is possible to predict the equilibrium state with the thermodynamic relationship of components. It is very important to predict the equilibrium for an academic and economic reason. There are various thermodynamic equilibrium calculation programs available, one of them being the Multi-Phase Equilibrium (MPE) which is developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Mineral in Australia.

The trip was organized to attend the MPE Workshop with Professor Henri Gaye and my lab member, Sang Min Lee. We arrived in Australia through Sydney, which is widely known as the most beautiful harbor in Australia. On the weekend, we had a good time touring the beautiful city and experiencing the Australian culture, fresh seafood and wine, which is Prof. Gaye's second specialty?

Master Program
CSL GIFT POSTECH
Kim, Ye Jin

Computational Metallurgy Laboratory

Ph.D Student CML, GIFT, POSTECH
Kim, Dae Woo

Steel..

It is the oldest and the most useful man-made material in human life. As industry grew and technology became advanced, it was necessary to launch new development of steel research to satisfy diverse demands of people. For this, many engineers and scientists have exploited the ever-growing power of computers and computational methods, and now we can not imagine research without them. Many works and papers have proved that computers are extremely useful not only in the area of materials science and engineering but also in that of chemical engineering, bio technology, etc.

In Computational Metallurgy Laboratory (CML), we develop and exploit theories and experiments using computers to create novel alloys of iron. CML is comprised of two students in Ph. D. program, nine students in M.S. program, and four professors, and we are involved in various interesting research projects.

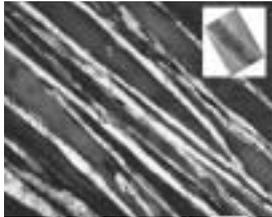


Fig.1 Transmission electron micrograph. The inset is an image of a carbon nanotube at the same magnification.

The first project is on an investigation of novel hard bainite, called 'Super Bainite', and this work is carried out by Hong Suk Yang. Imagine a steel which is exceedingly strong, easy to manufacture, cost-effective, and which can be made in large chunks. The novel steel which satisfies these criteria relies on choreography of atoms during the course of bainite transformation. In particular, the scale and extent of the structure is directly dependent on the fact that the atoms move in a disciplined fashion. This information can be exploited to develop unconventional alloys, for example, rail steels which do not rely on carbides for their properties and the hardest ever bainite which can be manufactured in bulk form without the need for rapid heat treatment or mechanical processing. Hard bainite has been developed using the theory only. By making the structure of steel fine, it is possible to obtain high strength and ductility simultaneously. The structure of the super bainite is extremely fine if you see the scale bar below and the carbon nanotube at upper right side [Fig. 1]. The strength of the super bainite is very high with high toughness. It can be made by simple processes for bulk material, which means cost for them is low. We are developing the theory for bainite transformation and new super bainite alloy.

Secondly, an investigation on properties of materials with 'Neural Network' has been carried to predict the impact on the toughness of weld metal. Jun Hak Pak and Joo Hyun Ryu are currently the predominant users. Welding process is necessary to build a structure of complicated shape; thus, mechanical properties of welding points are undoubtedly very important. However, it is often very difficult to maintain good toughness over 690MPa. In order to solve such problems, several variables which influence the final properties of materials must be identified as the first step, and there are some limitations for classical modelling due to the complex relationship between each variable. For this reason, Neural Network, one of mathematical tools, is used to find the correlation between input values and output values (In this case, Impact Toughness)

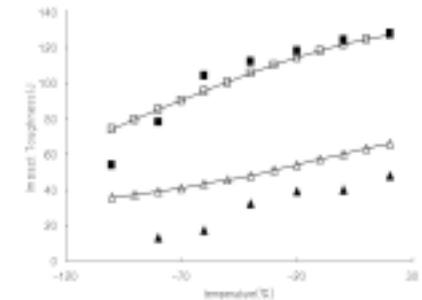
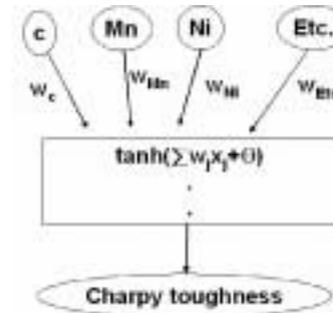


Fig.2 The concept of Neural Network to predict the Charpy toughness of steel (left). Experimental results and theoretical results predicted by Neural Network (right).

One project uses the first principle calculation to investigate materials property, and it is carried out by Jae Hoon Jang and supervised by Professor In Gee Kim. The first principle calculation is a method based on the first principle, which explains condition of materials by using solutions of the Schrodinger equation. It is very difficult to get the exact solution in many particle systems due to the complexity of relativistic effect and PDE solution. However, if we calculate the forms of atomic nucleus, ions and free electrons under some approximation, such as density functional theory, adiabatic approximation, local density approximation, generalized gradient approximation and augmented plane-wave method, it is possible to predict the mechanical properties, stability of materials and spontaneity of reaction, etc. Fig. 3 shows the results from modelling.

Other research activities include the investigation of Voronoi Algorithm to construct the space filling, conducted by Jae Yong Chae, and computational work to predict texture phenomena during deformation and phase transformation occur, conducted by Bo Qin and myself.

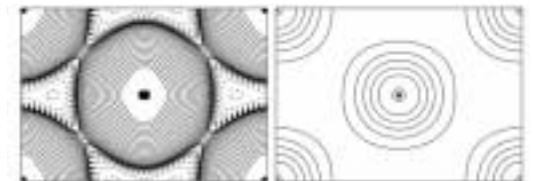


Fig.3 The modelling results: Spin density of iron (left). Charge density of electron of iron in (110) plane (right)

I personally believe that the merits of CML are a good balance of theory and advanced experiments and close cooperation between materials scientists, computer scientists, chemical engineers, physicists, chemists and mechanical engineers. Hopefully one day, CML will rise as the Mecca of computational research lab.

My Best Choice

GIFT

Master program 2nd year student
MDL, GIFT, POSTECH
Kim, SungJin

At the moment of choice, a great deal of consideration, such as comparison between my objective and the opportunity cost, arise in my mind. As it is not the situation in a game where a save and load function is possible, I should not succumb to the sneaking anxiety while investigating my options iteratively from alpha to omega.

Like every other day, my undergraduate department office was crowded with the students who wanted to ask about the graduation or getting into a graduate school. However that day, I noticed a subtle difference from the other days because most of the students were staring at the same notification: the Entrance Presentation of the Graduate Institute of Ferrous Technology, Pohang University of Science and Technology. I was also one of the people paying close attention to the notification. Similar to many of my friends, I also worried about my future. I was a 4th year student who only had one semester left before the graduation. It was almost time to decide which path I will take. Because I had been interested in metals for a long time and studying that field, I made a note about the presentation as I was leaving the crowd.

On the very day of the presentation, the sketch of the GIFT presentation was fascinating enough to grasp our interest. However, I felt that something was not satisfactory, and it was easy to see a similar insecurity on the face of many other audiences. Despite the many attractive things GIFT could offer to us, the incomplete establishment of GIFT triggered suspicions and questions in our mind. It must have been the weakest point about GIFT. However, I believed the words of the presenters and made up my mind regardless of my initial doubts.

Though less than a year has passed, I firmly believe that the choice I made could not have

been better. Rather than the suspicions I had about GIFT, I soon realized that GIFT was an institute full of challenges and opportunities. The Materials Design Lab (MDL), which I am part of, conducts research on the improved alloying design and mechanical properties. One of the most important parts of our study is dependent on the mechanical property analysis and thermo-mechanical process design. We are trying to construct our lab according to our objectives, which are to collect accurate and proper data.

In order to realize our objectives, we organize regular meetings and seminars together to discuss about the equipments to be purchased in MDL. After we determine the equipments we will need, we participate in the installation training and test them with the company technicians. Moreover, presentations about why such things are necessary for our lab or what the best sequence of the instruments is are also decided by us. People in my lab are at different ages and come from different cities and countries, and we are getting accustomed to the efficient and practical operations under the guidance of great professors. Furthermore, the lectures held by famous and active professors from all over the world are also highlights of GIFT.

Compared to Seoul, Pohang is a small and isolated city in Korea. It was very sorry to leave good friends, juniors, seniors and professors who gave me invaluable advice in life. However, being in the environment of neat and tidy laboratories, firm administration support, the latest experimental equipments, a liberal discussion with the professors far outweigh my initial anxiety. At the end of this semester, we expect to have most of the necessities required for our research. Then I can do experiments independently on what I have learned during this semester.

I feel very fortunate to be a student in GIFT.

Wednesday Wine Class : Types of Grapes

Master program 1st year student
MDL, GIFT, POSTECH
Jung, Il Chan

Hello, I am the new assistant of the wine class, led by Professor Henri Gaye. I thank Professor Gaye and a former assistant, Sung Jin Kim, for giving me a chance to serve as the next assistant of this class. In the beginning, I had no knowledge about the wine; however, after helping out with the preparation of wine classes, I gradually learned more about wines. I want to give a brief introduction of wine and talk about the types of grapes. If you see the label on a wine bottle, you can easily find the types of grapes inside of it such as Cabernet Sauvignon, Merlot or Muscat.

First, Cabernet Sauvignon is synonymous with serious red wine capable of ageing into subtle splendor. For this reason, Cabernet Sauvignon is the best-traveled red wine, but it is viable only in warm climates since it is a relatively late-ripener. It will not necessarily ripen fully every year even in its homeland of the Medoc/Graves. But when it does ripen, the color, flavor, and tannins packed into the thick skins of its tiny and dark blue berries can be remarkable. Therefore, most of the high quality red wines are made from Cabernet Sauvignon, and those made in a certain good harvest year can be very expensive.

Second, Merlot is a good blending partner with Cabernet Sauvignon in Bordeaux where its earlier

ripening makes Merlot so much easier to grow. Its bigger berries and thinner skins generally mean less tannic and more abundant wines that can be enjoyed sooner. Merlot wine is produced not only in Bordeaux but also in Italy, US and Chile. If you dislike too dry and tannin wines, I recommend the wine made from Merlot.

Finally, Muscat is a type of grape for white wine. Muscat wine is made in France, Italy, Greece and Spain. Although its flavor is relatively simple, it is very sweet. Many Koreans buy any white wine and expect them to be sweet; however, they soon get disappointed with the unexpected dry taste. If you want to surprise someone special who is not a wine specialist, I strongly recommend the white wine made from Muscat not Chardonnay or Sauvignon Blanc since they may be dry.

The proof of the pudding is in the eating. The wine class is held on every other Wednesdays. All GIFT members are welcome to participate in the class and taste and compare wines made from Cabernet Sauvignon, Merlot, Muscat, etc. We are making a best wine collection list of wines available in Pohang based upon the opinion of the wine class attendees. In order to provide a variety of wines, your regular participation as well as financial support is important. Thank you.

Steeluniversity.org Challenge 2006

At the second annual "Steeluniversity.org Challenge 2006", the university winner was a team (Zhao Chong, Qin Bo, Chen Lei) from the Graduate Institute of Ferrous Technology of Pohang University of Science and Technology. Among the top 10 entrants, three teams from GIFT had placed overall sixth, seventh, and ninth in the world. Eight students who won the challenge were given an opportunity to attend a public workshop and the 2006 Steeluniversity.org Challenge Prize Ceremony in China on April 16.



The International Iron and Steel Institute (IISI) is one of the largest and most dynamic industry associations in the world. IISI represents over 190 steel producers (including the world's 20 largest steel companies), national and regional steel industry associations, and steel research institutes. IISI members produce around 60% of the world's steel.

Steeluniversity.org is an on-line initiative developed by the International Iron and Steel Institute. The website provides free learning resources and information covering all aspects of iron and steelmaking processes. The Steeluniversity.org Challenge provides an opportunity to compete worldwide in a 24 hour competition based on one or more of the steelmaking simulations.

At the second annual "Steeluniversity.org Challenge 2006", three teams from GIFT placed the 1st, 2nd, and 3rd place in the student category in the world, placing 6th, 7th, and 9th overall. Eight students who won the challenge were given an opportunity to attend a public workshop and the 2006 Steeluniversity.org Challenge Prize Ceremony in China.



On April 16, 2007, at 3 pm, we received a trophy presented by Ms. Xie, Qihua, former Chairwoman and President of Baosteel, in Kempinski Hotel, Beijing. It was just a small competition, but it meant a lot for us because we have been trying to be the best in ferrous technology. We felt very proud to let the world know who we are. We obtained knowledge about steelmaking during the simulation competition and the most important lesson in our life: never give up too early. We learned passion for the steel from our professors and how to try our best to win. And we did it!

The trophy in our hands reminded us of those nearly 24 hours of hard working, our professors, our staff members and our colleague.

Before I began writing this report, I received an e-mail from the IISI and was informed that the trophy will be with us for a year and transferred to the next year's winners. After hearing that, the trophy became more precious to me. We hope that we can keep the Trophy at GIFT for a long time, for we will be the world's best in the field of steel research. It will be a challenge for all the members in GIFT.

GIFT NEWS



세계 유일 철강전문대학원 설립 공로 철강대학원 이해건 교수 한국공학한림원 일진상 수상



철강대학원 이해건 교수가 제3회 한국공학한림원 일진상(산학협력 증진 부문)을 수상했다. 올해로 제 3회를 맞는 일진상은 한국공학한림원이 산학협력 증진과 기술정책 등에서 국가 기술 발전에 기여한 개인을 발굴, 시상하는 것으로 석명학술진흥재단 이사장 허진규 일진그룹 회장이 후원하고 있다. 이해건 교수는 POSTECH에 세계 유일의 철강전문대학원을 설립, 전문인력을 양성하여 국내 철강산업을 발전시키는데 크게 기여한 공로를 인정받아 이상을 수상하게 되었다. 시상식은 2006년 11월 21일 서울 한국기술센터에서 열린 한국공학한림원 정기총회에서 있었다. 수상자에게는 상금 2,500만원이 부상으로 수여되었다.

[2006-11-21]

포스텍 철강대학원 병역특례기관 선정

포스텍 철강대학원이 병역특례기관으로 선정됐다. 포스텍에 따르면 철강대학원은 지난해 11월 병무청으로부터 병역지정 전문연구요원 대학연구기관으로 선정됐다. 철강대학원은 지난 2005년 9월 석·박사과정의 전문대학원으로 개편됐으며, 철강대학원 입학 시 포스텍 일반대학원과 동일하게 병역특례가 가능하게 됐다.

이에 따라 철강대학원 박사과정 입학 예정자들을 대상으로 국가 전문연구요원 시험을 보고 합격한 학생에 한해 '전문연구요원'의 자격을 주고 박사과정 시 2년간의 수업을 마친 뒤부터 복무가 시작되며 전문연구요원의 복무기간은 3년이다.

[2006-11]

세계 유일 포스텍 철강대학원-포스코와 전략적 파트너십 강화

포스코는 산학협동의 모범기업이다. 포스텍과의 공조체제는 이미 널리 알려진 사실. 2006년 9월에는 포스텍 내에 세계 유일의 철강대학원을 개원해 전략적 파트너십을 한층 강화했다. 포스텍 철강대학원은 철강 교육·연구의 메카를 꿈꾸고 있다. 철강 고급인력을 양성하고, 신기술 개발을 주도해 세계 철강사 선호 1위 교육기관이 되겠다는 것이다. 이를 위해 해외 석·박사, 세계의 영재 선발, 전문연구실 구축 등에 박차를 가하고 있다. 특히 전 세계 철강연구의 싱크탱크 역할을 하게 될 10여개의 철강전문연구실은 '석·박사급 이상 전문연구원-대학원생' 체제를 갖춰 실질적인 산·학·연 협력시스템이 가동되도록 할 방침이다.

이구택 회장은 "향후 기술 우위의 일본과 원가 우위의 중국 특

세에서 파이넥스 공법같은 포스코만의 고유 핵심기술을 개발하기 위해서는 산학협동 프로그램이 결정적 역할을 할 수 있을 것"이라고 지적했다.

포스코가 주최하는 '철강학술 심포지엄'도 산학협동의 좋은 사례다. 이 심포지엄은 올해가 2회째다. 지난 8월 열린 심포지엄에는 포스코가 미래 철강전문인력으로 선발한 철강연구장학생, 철강전문교수 및 위탁연구수행교수 산하 대학원생 등 60여명이 참석했다.

포스코는 앞으로도 대학 연구자원을 더욱 체계적으로 육성·지원하고 산학협력 관계를 공고히 한다는 취지에서 '포스코 철강학술 심포지엄'을 해마다 정례화 해 운영할 계획이다.

[2006-11-17]

포스텍, 유럽 대학과 학술교류 슬로바키아공대·그라츠공대와 인적교류

포스텍이 유럽 지역 공과대학들과 연이어 학술교류협정을 체결하고 유럽대학들과의 활발한 교류에 나서 눈길을 끌고 있다.

포스텍에 따르면 이 대학 박찬모 총장은 지난달 30일부터 4일까지 오스트리아 그라츠에 위치한 그라츠공대, 슬로바키아 브라티슬라바에 위치한 슬로바키아공대를 차례로 방문, 학술교류협정을 체결했다.

포스텍은 우선 철강대학원 학생과 교수를 이들 대학과의 연구 참여 목적으로 파견하기로 했다. 포스텍 관계자는 "타 학과와의 교류 협력도 확대해 나갈 것"이라며 "이들

대학과의 인적 교류 및 연구협력을 통해 국제 공동연구는 물론 글로벌 리더 양성에 큰 도움이 될 것"이라고 말했다. 포스텍과 학술교류협정을 체결한 슬로바키아공대는 1938년 설립돼 1만8000여명의 학생이 재학 중이며 170여개 국제 연구과제는 물론 900개 산업계 연계 프로그램을 계약한 연구 중심대학이다. 오스트리아 그라츠공대는 1864년 설립, 8780명의 학생이 재학하고 있으며 그중 61개교 1131명이 외국인 학생일 정도로 국제적으로 경쟁력을 인정받는 공과대학이다.

[2007-05-07]

POSCO 특별채용 전원 합격

우리대학 철강대학원 석·박사과정 재학생을 대상으로 실시한 POSCO 특별채용에서 박사 3명과 석사 9명 등 지원자 12명 전원이 합격했다. 철강전문대학원 출범이후 처음 실시된 POSCO의 특별채용은 박사과정 및 석사과정 3학기 재학생 중 병역을 마친 학생을 대상으로 지난 3월 실시했다. 앞으로 매년 계속될 이 제도에 의해 재학생들은 등록금을 비롯해 학비보조금과 복리후생비를 지원받으며 미래가 보장된 상태

에서 한층 더 안정적으로 학업에 매진할 수 있게 되었다. 이번 에 합격한 박사과정 학생은 4월부터, 석사과정 학생은 박사과정에 진학하게 되면 졸업까지 매월 250만원의 학비보조금과 별도의 복리후생비를 지원받게 된다. 철강대학원 관계자는 "세계적 철강기술을 선도해 나갈 우수인재로 성장하는데 보다 나은 환경이 조성된 것은 철강대학원 발전에도 매우 고무적인 일이다" 고 말했다.

[2007-05]

2007 GIFT Admission Information Session at POSTECH

GIFT admission info session was held in mid June. Those of who were interested in GIFT admissions were welcome to learn about our school. It

provided a great chance to talk to directors and to discuss their further study plan over dinner.

[2007-07]

2007 GIFT Summer Research Participation Program

전국의 우수한 이공계 대학생들에게 철강분야 연구에 관심을 높이고 최첨단 환경속에서 연구에 직접 참여할 수 있는 기회

를 제공하여 앞으로의 연구방향과 진로 선택에 도움을 주고자 마련한 프로그램이다.

[2007-08]

News and Event



► 2006 Steeluniversity.org Challenge Prize Ceremony in Beijing

The International Iron and Steel Institute (IISI) is one of the largest and most dynamic industry associations in the world. IISI represents over 190 steel producers (including the world's 20 largest steel companies), national and regional steel industry associations, and steel research institutes. IISI members produce around 60% of the world's steel. Eight students who won the challenge were given an opportunity to attend a public workshop and the 2006 Steeluniversity.org Challenge Prize Ceremony in China on April 16.



► 2007 GIFT Promotional Delegations in India

GIFT Promotional Delegation Teams visited Indian Institute of Technology campuses in India in March, 2007 and attended COMPOSIT (Congress of Metallurgical Professionals involving Students Industry & Teachers), March.17 to 19, 2007.



► GIFT Faculty's Publications

"STEELS, Microstructures and Properties" by H.K.D.H.Bhadeshia, R.W.K.Honeycombe, Butterworth-Heinemann, 2006
 "MATERIALS DESIGN, the Key to Modern Steel Products" by B.C.De Cooman, J.G.Speer, I.Y.Pyshmintsev, N.Yoshinaga, GRIPS Media GmbH, 2006



► Student's Day of Metallurgy in Leoben, Austria

- 13th International Student's Day of Metallurgy, Leoben, Austria, March 30th-April 1st, 2006
 - Visit to the Departments of Aerospace Engineering and Materials Science at the TU Delft, The Netherlands, April 3, 2006

Pride and Joy

"KISTI Super Computer Expert for SMB Supports"

The Korea Institute of Science and Technology Information (KISTI) recently appointed Research Associate Professor In Gee Kim as a "KISTI Super Computer Expert for SMB (Small and Medium Business) Supports."

"Honorable Certificate"

The award was given to a preminent scholar with distinguished achievements in the field of Materials Science by Higher Education Press, China.

"Science Direct TOP 25 Hottest Articles"

Most frequently downloaded paper, written by Prof. B.C.DeCooman

2007 GIFT Seminar in Spring Semester

월강분야 세계 최강의 인재- 포스텍 월강대학원에서 만날 수 있습니다.

Date	Lecturer	Affiliation	Topic
Mar. 15	Lee, Dong Nyung	GIFT (Graduate Institute of Ferrous Technology), POSTECH, School of Materials Science and Engineering, Seoul National University	Evolution of Recrystallization Textures in BCC Steels
Mar. 26	Alexander Chaus	STU (Slovak University of Technology)	Comparison of Cast and Wrought High-speed Steels
	Jozef Janovec		Non-equilibrium, Segregation and Segregation Kinetics
	Ludovit Kupca		Aging Monitoring of Nuclear Power Plants Components
Mar. 27	Jozef Janovec	STU (Slovak University of Technology)	Equilibrium Segregation of Phosphorus at Grain Boundaries of Alloy Steels
	Ludovit Kupca		Corrosion Monitoring Systems Performed in the Slovak Nuclear Power Plant
	Alexander Chaus		Non-ferrous and Carbureted High-speed Steels for Cast Metal-cutting tools
Mar. 28	Ludovit Kupca	STU (Slovak University of Technology)	Irradiation Embrittlement Monitoring Programs of Power Water Reactor
	Alexander Chaus	STU (Slovak University of Technology)	Application of Inoculants and Surface-active Additions for Solidification Structure Refinement and Properties Enhancement in High-speed Steels
	Jozef Janovec	STU (Slovak University of Technology)	Carbides in Low Alloy Steels
Mar. 29	Kim, Young Gul	Professor Emeritus, POSTECH	The Importance of Intellectual Property Rights
Apr. 5	Kim, Sung Jun	Korea Institute of Machinery and Materials	Precipitation and Deformation Behavior of High Nitrogen Austenitic Stainless Steels
Apr. 11	Yasushi SASAKI	Department of Metallurgy, Graduate School of engineering, Tohoku University	Reaction Kinetics of Fe-C-O-H System as a Tool for Surface Study
Apr. 12	Kang, In Seok	Department of Chemical Engineering Pohang University of Science and Technology	An Inverse Problem Approach to the Optimal Design of Magnetic Field in EMBR Process
Apr. 19	Min, Dong Jun	Department of Metallurgical Engineering of Yonsei University	Fe ?
Apr. 25	Qin, Rongshan	GIFT POSTECH	Fluid Processing in Steel Making
May. 3	Chung, Kwan soo	Department of Materials Science of Seoul National University	Characterization of Mechanical Properties of Welded DP Steels
May. 4	Park, Chul	Department of Aerospace Engineering of KAIST	Overview of Emission Spectroscopy for Nonequilibrium Light Source
May. 10	Pak, Jong Jin	Department of Materials Engineering of Hanyang University	Some Topics on Refining of Ferritic Stainless Steels
May. 17	Kwon, Ohjoon	POSTECH Standing Advisor	What do We have to Know about Steel Additionally?
May. 31	Jeong, Woo Chang	Catholic University of Daegu	Alloy Design and Microstructure of Steels for Automotive Application
Jun. 7	Park, Jong Myoung	GIFT POSTECH	Non-Chrome Surface Treatment for Steel Alloys
Jun. 19	Elena Pereloma	School of Mechanical, Materials and Mechatronics Engineering, University of Wollongong, Australia	Application of Atom Probe Tomography to Study Solute Segregation, Clustering and Fine Precipitation in Steels
	LB racke	CRUS Research, Ijmuiden, The Netherlands	Current Product Development Issues at the Corus Direct Sheet Plant
Jul. 3	Keneth E. Blazke	ArcelorMittal USA Research	Issues Related to the Casting of High Aluminum TRIP Steels and a Method to Determine the Peritectic Region for Steel Alloys
Jul. 3	Yin, Hong Bin	ArcelorMittal USA Research	Application of Confocal Scanning Laser Microscope in Steel Industry

Pohang University of Science and Technology (POSTECH) Graduate Institute of Ferrous Technology (GIFT)

GIFT Faculty

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Contact:

Graduate Institute of Ferrous Technology (GIFT),
Pohang University of Science and Technology (POSTECH)
Pohang, Kyungbuk, 790-784, Korea
[TEL] +82-54-279-4415 ~19 / [FAX] +82-54-279-4499
[Email] gift-home@postech.ac.kr/ [Web] gift.postech.ac.kr

