

## Some Impressions from Visit in Japan Sept. 1993

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Nippon Steel Advanced Materials and Technology Research Lab.  
Kawasaki City (Sept. 1)

Dr. Tooru Matsumiya gave a short introduction to the most impressive work that goes on at the division of computational science of the future and frontier field department. The computational approach involves, for example, such complex problems as the flow of slag particles in a molten steel by solution of the hydrodynamic equations, first-principles calculations of the electronic structure of TiAl intermetallics expected as future aerospace materials and simulation of solidification of stainless steels by application of fundamental thermodynamic and kinetic data. The work presented to me is, without doubt, of very high international standard and should be a most valuable tool for the long-term development at the Nippon Steel Corp. As a westerner scientist one is certainly not used to see such a strong effort towards the fundamental aspects of science and engineering at an industrial lab.

Nippon Steel Research and Engineering Center Futtsu (Sept. 2)

The new research and engineering center in Futtsu is a part of the Technical Development Bureau and was completed in 1991. The center is specially designed to exploit the creativity of the researchers and engineers by providing an excellent environment for interpersonal exchanges. In addition to an impressive arsenal of experimental equipment, including various electron microscopes and atom probe, there is plenty of space for informal discussions and leisure. Exchange of ideas and personnel with foreign countries are encouraged. In addition to the more basic experimental facilities mentioned the center contains large scale equipment for simulation of industrial processes. For example, the equipment for simulation of hot rolling is more like a pilot plant rather than simulation equipment.

Workshop on Phase Diagrams Hotel Mt. Fuji (Sept. 3,4)

The workshop was held in honor of Professor Taiji Nishizawa after his retirement and was organized by Professor Ishida and other former students of Professor Nishizawa. Around 100 participants, mostly former students but also colleagues from abroad, had gathered at Hotel Mt. Fuji. Unfortunately, there was a typhoon during the meeting so Mt. Fuji could not be seen. Professor Nishizawa gave the first lecture on the magnetic effect on phase equilibria in steels, a field where Nishizawa made pioneering contributions two decades ago. After Nishizawa's talk there were several talks on various aspects of phase diagrams. For example, Professor Mats Hillert discussed the Le Chatelier's principle, Professor Björn

Uhrenius phase equilibria in carbide systems and Dr. Tim Chart calculation of multi-component alloy phase diagrams. However, to me the most interesting talks were given by the former students of Professor Nishizawa. Even though these talks were given in Japanese I could grasp the major content from the transparencies with diagrams, micrographs and equations. One may mention, for example, the talks by Dr. Ohtani on phase equilibria in microsolding materials, by Dr. Togashi on graphitized steels and by Mr. Akamatsu on carbon redistribution in clad steels and finally the last talk by Professor Ishida on microstructural control of new functional NiAl-based alloys by application of phase diagrams. The presentations, covering a wide range of topics, show the excellent quality of the students produced by Professor Nishizawa. The meeting was held in a most friendly atmosphere and there were many opportunities for valuable discussions.

COMMP'93 (Sept. 6-9)

The meeting was held at the Nippon Toshi Center in Tokyo and had about 120 participants from many different countries. The speakers had been asked to handle in their manuscripts already during the spring and as a result each participant was given a quite impressive volume of the conference proceedings when registering. In the first 3 plenary talks overviews of computer simulations in materials engineering were given. Professor Schwerdtfeger discussed various aspects of solidification, Professor Doyama first principles calculations and Professor Kirkaldy heat treatment of steel. Although the different authors had quite different points of view they all emphasized the engineering aspect of simulations. The simulations are, at best, a powerful tool in materials engineering. One should not strive for the most exact solution of a problem but rather the solution that may be applied to solve an engineering problem. Professor Kirkaldy emphasized the importance of empiricism in engineering. The last plenary talk was given by Dr. Koszykowski and involved the usage of massive parallel computing on distributed networks with work stations. Since such networks are now available at many laboratories it may be a cost-efficient way of having super computer capacity without buying the actual super computer.

The remaining contributions were divided into 3 parallel sessions and a poster session. In each parallel session several keynote lectures were given.

I chose to follow the session on characterization and design of microstructure where I gave a keynote lecture myself. During Tuesday the talks in this session covered thermodynamics and diffusional transformations and dur-

ing Wednesday texture development and grain growth. The talks were generally of high quality. It is encouraging to see that several groups are now tackling similar problems with similar approaches based on sound physical insight. However, as was pointed out by professor Hillert in a discussion, much effort is now spent in developing soft ware rather than advancing the insight in the underlying physics and much would be gained if the different groups could agree upon the methods and the soft ware and concentrate their efforts on the real problems. The situation was similar in Calphad a decade ago but now only a couple of standard soft wares are used.

It is also clear from several talks that well assessed input data are needed in order to obtain useful results. More work is thus needed to obtain more thermodynamic data and diffusion data.

Although the presentations I listened to were generally good I think the conference as a whole would have been better if it had not been condensed into 3 parallel sessions. The conference started on Monday afternoon and Wednesday afternoon had only the poster session and the conference stopped during Thursday afternoon. If thus seems as

the time could have been used more efficiently without dividing the program into three parallel sessions.

However, on the whole the conference was a success although unfortunately the number of participants was not as high as one would have expected.

#### Concluding Remarks

Generally speaking I am much impressed over the research work I have seen in Japan. It is very ambitious and based on sound principles and clearly it is of highest international standard. However, I have met several Japanese researchers who are now worried about the decrease in funding to research. This decrease is a consequent of the recession in Japanese economy.

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## ちよつと気にかがること —Materials Week '93に出席して—

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去る10月17日から4日間、米国ピッツバーグ市で標記の展示会と研究集会在TMS (The Minerals, Metals and Materials Society) とASM International の共催で開催されました。この集会はいろいろなcommitteeが計画したsymposiumが主体で、一部にgeneral abstract session と称する一般申込みによる発表が含まれています。一昨年までは同じ会期ながら、研究発表についてはTMS とASM Intern. とは独立に運営されていましたが、昨年からはすべて一本にまとめられています。

私は大小合せて52あったシンポジウムの中の金属間化合物関係のものに参加しました。鉄鋼関連でもいくつかのシンポジウムが開催されており、その中の一つにThe Ferrous Metallurgy Committee (TMS) 及びThe Materials Science Committee (ASM) 主催でProf. A. J. De Ardo (Univ. of Pittsburgh) 他10名が組織委員となっているInternational Symposium on Low Carbon Steels for the 90's という3.5日にわたる集会がありました。どのシンポジウムにも米国以外の研究者による発表が含まれているのですが、国際と名付けられたものはこの1件だけです。

このシンポジウムに顔を出したわけではありませんが、プログラムに載ったセッション名と発表件数は別表のよう

になっており、製鋼に始まって厚板、薄板から溶接まで低炭素鋼全般にわたる講演80件が含まれています。参加(発表)国の分布を見ると、総合講演6件はいずれも米国ですが、一般講演74件中米国からのものは18件(約1/4)です。これは開催国という点から見れば、むしろ少なめとも言えるかもしれません。約3/4を占める米国以外からの発表は、中国を筆頭に、台湾、インド、英国、ドイツ、カナダ、メキシコ、ブラジルなどが主なところですが、また、研究者が2国間に跨がる研究発表も7件(約1割)あります。

ところで、日本からはロシア、オーストラリアと並んで3件の発表が登録されています。日頃聞かされている鉄鋼業の技術力から考えると、低炭素鋼の国際会議に日本から3件しか発表がないということは、私には大きな驚きでした。帰国後少し調べてみたところ、この国際会議のことは日本の企業の方々は知ってはいたようでした。しかし、今更このように漠とした主題の集会にわざわざ出かける程のことはないというわけで、日本からの発表は極めて少なかつたらしいと思われまます。

この分野でも先頭を走っている(つもりの)日本としてはこのシンポジウムにあまり興味が無かったことは致し方ないことであつたかもしれません。しかし、いささか気に