CHEMRAWN XVI CONFERENCE

Consultation Forum
Innovation: the way from pure to applied chemistry.
organized by

CHEMRAWN COMMITTEE of
INTERNATIONAL UN ION OF PURE AND APPLIED CHEMISTRY

SECOND CIRCULAR

VENUE : University of Ottawa, Ottawa , Canada (specific site available at registration desk)
August 9 2003

BACKGROUND INFORMATION

The CHEMRAWN (CHEMical Research Applied to World Needs) Committee of the International Union of Pure and Applied Chemistry organizes conferences world wide to explore ways that the chemical sciences can meet crucial human needs. Since 1978 twelve Conferences have been held; three more are in preparation. Past conferences focused on evaluation of organic resources and their conversion (CHEMRAWN I and CHEMRAWN III), food supplies (CHEMRAWN II and planned CHEMRAWN XII), advanced materials (CHEMRAWN IV and CHEMRAWN IX), contribution of chemistry to the health (CHEMRAWN V), chemistry of the ocean and atmosphere and analytical chemistry for the environment (CHEMRAWN IV, CHEMRAWN VII, and CHEMRAWN XI), chemical education (CHEMRAWN X), and sustainable development (CHEMRAWN VIII and CHEMRAWN XIV).

CHEMRAWN XVI will examine the innovation process in the chemical industry; techniques for more effective development of new products and processes; and approaches to overcome the significant barriers encountered in these efforts. Firms require good technology strategies, sufficient R&D budgets, talented researchers with state-of-the-art instruments, and equipment, capable market development, and a favorable economic and regulatory environment. Significant obstacles exist that hinder innovation in the chemical industry; these obstacles differ country to country. The CEFIC Barometer of Innovation and Competitiveness -2000 indicates large differences between the European Union and USA approaches to innovation, especially in R&D expenditures and regulatory requirements impacting R&D. For other countries having large scale Government supported R&D efforts (e.g India, China) technology transfer mechanisms from the government laboratory to industry are critical.

CHEMRAWN XVI will assist in promoting the most modern approaches to transforming processes of pure chemistry, usually laboratory scale, to results on the industrial scale.

Those involved in the conference will come from the companies providing R&D with the instrumentation for process development: the companies providing the technology information for purpose of the strategy selection, the soft-ware producing companies providing the modern software for chemistry and engineering purposes, the producers of pilot installations in a standard way combining the unit processes (multipurpose batch plants), companies applying micro- pilot plants in the process development in particular those supplying the micro-instrumentation, academic laboratories which have developed green chemistry-based synthetic pathways, and the companies using such hardware, software, and information.

PURPOSE OF THE CONFERENCE -- CONSULTATION FORUM I

This Consultation Forum will review the practices of the innovative process presenting the instrumentation and procedures of transformation of the invention into established production process and/or marketable product as well as stimulating the introduction more efficient practices for the innovation industrial implementation.

CONFERENCE ORGANIZATION AND TOPICS

The Conference has three parts:

a) **August 9: A workshop or consultation forum organized as an open discussion on the topics previously mentioned. Contributors and participants will include interested CHEMRAWN Committee members and other participants in IUPAC's Congress and General Assembly**

b) **August 12: The meeting of the CHEMRAWN Committee with the Committee on Chemistry and Industry (COCI) where continuing discussions will take place and members will function as "The Future Actions Committee" developing perspectives and recommendations from the August 9 presentations.**

c) **The proceedings from the conference will be put for the open discussion on the web site of CHEMRAWN and COCI Committees for certain period of time and after that the final report in form of Conference Proceedings would be published.**

FORUM ORGANIZERS

The Forum organizers are the CHEMRAWN and COCI Committees of IUPAC. The Chairmen of the Forum is Prof. Dr. Michael Droescher, Degussa, Germany.

The Organizing Committee of the Forum will prepare the report containing the papers as well the discussion results presented by the topic panel chairman of the Conference.
No proof-reading by the editor of the proceedings is foreseen, therefore, authors are responsible for the correct version of the text of their papers. The proceedings of the Conference will be issued three months after conclusion of the Conference and will be available for discussion on the CHEMRAWN web site.

PARTICIPANTS

As mentioned above it is expected that representatives of specialized companies, industry and academia will participate in the Forum. The participation in Forum is free of any charge. Participants are asked to fill out a short registration form available at the entrance to the Conference facilities.

LANGUAGE

The Conference language is English

LOCATION AND TIMETABLE

The Forum will take place on the campus of the University of Ottawa, August 9, 2003. The information of the room for the Conference will be given at the registration desk.

TENTATIVE AGENDA

August 9, 2003
9:00 – 9:05 Opening of the Conference: Prof. Dr. M. Droescher
9:05 - 9:20 Welcome from the CHEMRAWN Committee : Dr. P.M. Norling

9:20 – 11:25 Panel I : Chairman Dr. J.A. Kopytowski

9:20 – 9:40 Paper N1.1 Transformation of the old process: ethylbenzene to styrene with CO2 dilution
Min Che Chon, Chon International Company, Ltd. Republic of Korea

9:40 – 9:45 Questions/Answers

9:45 – 10:05 Paper N1.2 Use of X-ray Imaging in the Innovative Development of BP's LEAP Technology

Dr. Merion Evans, Hull Research and Technology Center BP Chemicals Hull, UK

10:05 – 10:10 Questions/Answers

10:10 – 10:30 Paper N1.3 New Innovation Concept at Degussa Project Houses and New Business Development
Michael Droescher` Corporate Innovation Management Degussa AG, Germany

10:30 – 10:35 Questions/Answers

10:35 – 10:55 Paper N1.4 Innovation in the US Chemical Industry
Parry M. Norling, RAND, USA

10:55 – 11:00 Questions/Answers

11:00 – 11:20 Paper N1.5 Peculiarities of innovation process in Russia and Siberia
Fedor Kuznetsov, Russian Academy of Science, Russia

11:20 – 11:25 Questions/Answers
11:25 – 11:45 Coffee break

11:45 – 13:00 Panel II Chairman Prof. Dr. M. Droescher

11:45 – 12:05 Paper N2.1 Innovation Tools for Commercializing Process Technology
Robert H. Jensen, Stanley A. Gembicki
UOP LLC

12:05 – 12:10 Questions/Answers

12:10 – 12:30 Paper N2.2 Invention to innovative process bridge: heuristic rules
J.A.Kopytowski, Industrial Chemistry Research Institute, Warsaw, POLAND

12:30 – 12:35 Questions/Answers

12:35 – 12:55 Paper N2.3 Company instruments in speeding up innovation to be applied product (provisional title)
Rafik Loufty (invited, not yet confirmed), Xerox Corporation, Canada

12:55 – 13:00 Questions/Answers

13:00 – 14:00 Lunch Break

14:00 – 14:20 Paper N2.4 Evaluation and comparison of the processes. (provisional title)
G. Intille, SRI Consultants, USA (invited not yet confirmed)

14:20 – 14:25 Questions/Answers

14:25 – 14:55 Paper N2. 5 Technological pool - bridge between University and Industry
Alberto Nieto, Universidad de la Republica, Montevideo, Uruguay

14:55 – 15:00 Questions/Answers

15:00 – 15:15 Coffee break

15:15 – 17:20 Panel III Panel Chairman Dr.P.Norling

15:15 – 15:35 Paper N3.1 Modalities of the innovation promotion in Nigeria
Ikenna Onyido, University of Agriculture, Makurdi, Nigeria

15:35 – 15:40 Questions/Answers

15:40 – 16:00 Paper N 3.2 Innovation in the Japanese Chemical Industry
Makoto Imanari, Mitsubishi Chemical Corporation, Japan

16:00 – 16:05 Questions/Answers

16:05 – 16:25 Paper N3.3 The role of professional societies in chemical innovation
John Malin, American Chemical Society, USA

16:25 – 16:30 Questions/Answers

16:30 – 16:50 Paper N3. 4 The changing face of chemistry in the United Kingdom
Alan Smith, United Kingdom

16:50 – 16:55 Questions/Answers

16:55 – 17:15 Paper N 3.5 Necessary policy measures to speed up innovation promotion in EU countries Humphris Colin, CEFIC, Belgium

17:15 – 17:20 Questions/Answers

17:20 – 17:40 Paper N 3.6 Chemical Education and Chemical Industry in Turkey Ayhan Ulubelen, Faculty of Pharmacy, University of Istanbul; Member of Turkish Academy of Sciences, Turkey

17:40 – 17:45 Questions/Answers

17:45 – 18:15 General Discussion

18:15 – 18:30 Remarks and Conclusions by CHEMRAWN Committee Members.

Further discussion is foreseen on 12 August at the joint meeting of IUPAC Committees: COCI and CHEMRAWN. (see GA timetable)

ABSTRACTS OF THE PAPERS

Panel I

Topic: Innovative Process and its modalities

Paper N 1.1 Transformation of the old process: ethylbenzene to styrene with CO2 dilution

Min Che Chon, Chon International Company, Ltd. Republic of Korea

This invention originated from the idea of utilization of carbon dioxide, a representative global warming gas, as the soft oxidant in oxidative catalysis. Before starting this research, most studies on catalytic conversion of CO_2 have been concentrated on the utilization as a carbon source through catalytic reduction processes with hydrogen, but this approach was found to be economically non feasible unless more efficient process for H_2 production is developed. So, the present inventors paid attention to another possibility to utilize oxygen atoms of a carbon dioxide molecule for not only the oxidant to abstract hydrogen atom in dehydrogenation of hydrocarbons but also an oxygen transfer agent in partial oxidation of hydrocarbons. The C-H bond dissociation through the hydrogen abstraction with oxygen species is generally accepted to be the rate-determining step in dehydrogenation of hydrocarbons. To date, styrene has been mainly produced by the EB dehydrogenation using potassium-promoted iron oxide catalysts with a large excess of superheated steam. It is one of the ten most important industrial processes. This reaction is generally carried out in vapor phase at 600 - 650^{o}C under steam, so that this commercial process using expensive steam consumes a large amount of latent heat of steam upon condensation at a liquid-gas separator following a reactor. Moreover, it is thermodynamically limited besides energy consuming. Use of traditional oxidant, oxygen is able to allow the overcome of the thermodynamic limitation, but a process with direct use of oxygen for oxidative dehydrogenation is not been realized yet because of a significant loss of styrene selectivity by the production of carbon oxides and oxygenates. Judging from such reasons described above and characteristics of carbon dioxide, the utilization of CO_2 as the soft oxidant can offer many beneficial advantages in styrene production

Based on these ideas, researchers of KRICT (Korea Research Institute of Chemical Technology) developed a novel process for dehydrogenation of ethylbenzene to produce styrene using carbon dioxide as soft oxidant, so-called KRICT-DECSO process. In addition to the above advantages, it is advantageous in the KRICT-DECSO process that very cheap carbon dioxide thus obtained from by-product of petrochemical oxidation or reforming process is utilized without further purification instead of using expensive steam dilution agent. The dehydrogenation catalyst employed comprises oxygen-deficient iron oxide and many promoters with transition metal oxides.

The KRICT-DECSO process is under verification through pilot-scale work so that process and engineering data necessary for the industrial application should be further collected. On-site mini-pilot plant is operating at Samsung General Chemicals Co., Ltd. (SGC). The scale of the pilot plant is 100kg of styrene monomer per day.

The project to develop and establish the KRICT-DECSO process was performed for the Greenhouse Gas Research Center, one of the Critical Technology-21 Programs, funded by the Ministry of Science and Technology (MOST) of Korea. A Korean small company has participated in this research as a partial financial sponsor, which has a plan to take a property for catalyst production of this process. And SGC has joined the project as a cooperating company and recently constructed pilot-scale demonstration

unit in the Daesan Petrochemical Complex and is still testing catalyst performance for this process.
Development of preparation method and scale-up technology of the commercial-type dehydrogenation catalyst to be sufficiently stable for the industrial application would be a key for the success of the process.

In spite of many beneficial roles of steam as dilution agent the main problems in the present ethylbenzene dehydrogenation process are confronted with thermodynamic limitation of the process and the use of steam. However, it is demonstrated that a decrease by up to 50^{o}C in reaction temperature through equilibrium alleviation could be accomplished using CO_2 as the oxidant. And considering energy saving effects due to a drop of reaction temperature and replacement of steam with CO_2, it estimated by process simulation that the energy consumption required for the EB dehydrogenation using carbon dioxide would be much lower than that for the currently operating process using steam. Now, the KRICT inventors are trying to verify such beneficial effects in mini-pilot plant work at petrochemical complexes.

Topic: Innovative Process and its modalities
Paper N 1.2 Use of X-ray Imaging in the Innovative Development of BP's LEAP Technology

Dr. Merion Evans

Hull Research and Technology Center BP Chemicals Hull, UK

In the mid 1990's, BP's restructuring of its European Chemicals operation led to the requirement for a world scale vinyl acetate monomer (VAM) manufacturing facility. The traditional fixed bed process would require too much investment - new technology was required to quickly unlock the next generation process.

BP focused its efforts into the development of alternative catalyst and reactor technologies. LEAP fluidized bed technology had demonstrated its potential at micro reactor scale, but the challenge was to take this technology to full-scale operation by 2001.

Fluid bed processes are difficult to scale up, as the complex interactions between process chemistry and fluid dynamics are difficult to establish at actual operating conditions. Conventionally, such processes pass through a 'demonstration' phase (a small scale commercial unit), which in this case would have led to an additional cost of $20-30M and an unacceptable delay of three to four years in commercial implementation.

In order to solve this problem, the development team broke down the challenge and developed techniques to understand each key step. The key challenges were:
- Formulating a precious metal catalyst in fluid bed form
- Establishing fluid dynamics and reactor design criteria for a fluidized bed.
X-ray imaging in BP's unique VIPA (Visualization, Imaging and Process Analysis) center was used to view and understand the fluid dynamics of a commercial scale reactor. The imaging process identified the best catalyst for fluidization and assessed the optimum use of various reactor internals. A unit containing the proposed internals was set up and comprehensive experiments were undertaken to assess their combined performance. This unit, whilst 70 times larger than the pilot plant was still 200 times smaller than the full-scale reactor.

A small pilot plant demonstrated the viability of the chemistry. Modeling was then used to combine the results in order to scale up pilot plant results by a size factor of 14,000 to the commercial plant scale. The resulting process started up successfully at the end of 2001. Within two hours of turning on the oxygen, the plant was producing on specification vinyl acetate. The fluidized bed had saved 30% in capital costs. This innovative route reduced the development time by three to four years.

Topic : Innovative Process and its modalities

Paper N 1.3 :New Innovation Concepts at Degussa
Project Houses and New Business Development

Michael Droescher
Corporate Innovation Management Degussa AG, Germany

Degussa is an entirely newly formed multinational corporation consistently aligned to highly profitable specialty chemistry. With sales of EUR 11,8 billion and a workforce of some 48.000 it is Germany´s third-largest chemical company and world market leader in specialty chemicals. In fiscal year 2002, the corporation generated operating profit (EBITA) of more than EUR 900 million. Degussa´s core strength lies in highly effective system solutions tailored to the requirement of its customers in over 100 countries throughout the world. led by the vision „Everybody benefits from a Degussa product – every day and everywhere".

The corporate unit Innovation Management plays are key roll in Degussa´s innovation process in supporting operational business units in there respective research and development efforts.

Corporate R&D activities with long term and strategic relevance are performed independently. These projects are run by the Creavis organization. They are focused on product or market segments outside the current portfolio that have high growth and revenue potential.

Innovation Management enhances the efficiency of R&D by creating and supporting corporate technology platforms. Examples are our so called project houses for nanomaterials, biotechnology and catalysis. In addition, partnerships with universities and R&D institutes are initiated worldwide.

The project houses run for three years to establish innovative technology platforms. The funding is provided by the participating business units to keep the focus on business issues and by corporate to promote the new platform.

Topic: Innovative Process and its modalities
Paper N 1. 4 Innovation in the US Chemical Industry

Parry M. Norling
DuPont, CR&D, USA

The US chemical industry has been facing consolidation, increased competition, reduced earnings, and declining market values. The "traditional" chemical industry (excluding life sciences) has seen its innovation rate dive during the past decade, as its R&D intensity (ratio of R&D spending to sales) has declined from 6% to 4%. While the US chemical industry is indeed large and mature, innovation may be the key to renewed growth. A study sponsored by the Council for Chemical Research found that for each dollar invested in chemical R&D produces approximately 2 dollars in income over the seven-year period. We will review a number of enabling tools that are being employed by the US chemical industry in efforts to spark this drive:

1) Modeling and simulation

Significant advances are being made in computational chemistry and modeling and simulation techniques. A number of modeling and simulation packages are now available.

2) Green Chemistry including bio-based processes.

CHEMRAWN XIV focused on green chemistry and our recent report "Next Generation Environmental technologies: Benefits and Barriers" looks at manufacturing processes derived from green chemistry. Many of these processes are bio-based using enzymes as the reaction catalyst.

3) Combinatorial chemistry and high-throughput experimentation

This methodology has enormous impact on the number of feasible options and solutions. The example of the results of collaboration between Smyx Technologies and Dow Chemical will be discussed. We will also mention some of the steps being taken by the US Government to promote innovation that can impact the chemical industry.

Topic : Innovative Process and its modalities

Paper N 1.5 Peculiarities of innovation process in Russia and Siberia

F. Kuznetsov, Russian Academy of Science, Russia

1. **Russia is at the moment in process of transition from socialist to market type of economy. Approach to innovation in such a period is a subject of hot discussion. Opinions differ from "raw material" supply model to model of most sophisticated "information-technology- based high tech"**
2. **In development and implication of innovation special role is being played by Institutes of Russian Academy of Science (RAS). RAS for a long period was main scientific network of the country. It includes now about 700 institutes located in different parts of Russia and working in all direction of modern science. Role of RAS lately become more important due to the fact that many research and design organizations previously associated with industrial ministries and enterprises were destroyed during "perestroika-reconstruction" period of 90s.**
3. **A good example of involvement of RAS in innovation process is "strategy of development of Siberia" document prepared by Siberian Branch (SB) of RAS. Contrary to develop Siberia as "raw material province" the strategy is oriented on innovation route. Recently Russian Government with strong support of President V. Putin has accepted the proposal of SB RAS.**
4. **The strategy calls for complex development of hydrocarbon resources of Siberia with production of value added products, development of educational system, high tech industry, communications, culture, and medical service.**
5. **Significant contribution to implementation of strategy is expected from chemical science and chemical industry. Examples will be given related to development and production of new materials, energy saving technologies, recycling of used items and industrial wastes.**

Panel II

Topic: Instruments of support in process of transformation of invention into innovative Process

Paper N 2.1

Innovation Tools for Commercializing Process Technology

Robert H. Jensen, Stanley A. Gembicki
UOP LLC

The worldwide process industry, which includes chemicals, petrochemicals, and petroleum refining, is a huge, complex, and interconnected global business. It achieved tremendous growth and development in the 20th century, driven primarily by innovation in chemistry and engineering. The industry also evolved in an era of relatively cheap energy and a seemingly limitless supply of raw materials. Today, new technology innovation in the process industry must not only seek to improve beyond the very high level of technology sophistication which already exists but also must recognize the limits articulated by Sustainable Development.

As a leading technology supplier, UOP LLC must continuously renew its process technology portfolio. UOP has employed a suite of innovation tools to enhance and accelerate its technology commercialization process. These tools have been implemented all along the commercialization path, providing fundamental knowledge that is essential to making correct decisions in a stage-gate process for technology delivery. This paper will give an overview of these innovation tools and will present some examples of their application at various stages of the commercialization of process technologies.

Topic : Instruments of support in process of transformation of invention into innovative Process

Paper N 2.2 Invention to innovative process bridge: heuristic rules

J.A.Kopytowski

Industrial Chemistry Research Institute, Warsaw, POLAND

The transformation of invention into innovative product or process is an activity of very low yield. Accordingly to the different research sources maximum 5% of the inventions find the way to the market. It means that it is impossible to carry out R&D process through all stages of development process (from idea to the product/process) for all inventions available. Therefore, every R&D institution (decision making body) must have a screening system allowing at certain stages of the R&D process to abandon part of research goal which is not meeting the established criteria. The screening system has to be established in specific way ensuring equal judgment of the results. Companies at large have their own evaluation system, some are subcontracting this task to a specialized companies under specific terms of agreement. Whatever are the modalities of evaluation they must be based on similar or even exactly same level of information as well as using similar evaluation instruments. In practice the following elements of screening system are considered obligatory:

a) **Primary results of the research (raw materials, reaction, kinetics, thermodynamics, parameters)**
b) **Technological flowsheet characterized by function parameters and algorithm of transformation of these inputs into uniform value**
c) **Estimate of structural elements size and cost and algorithm of transformation of this costs into investment cost**
d) **Select the integrated system of evaluation and evaluate results in strictly comparative modality**
e) **Control evaluation by the exogamic elements of the system through statistical analysis or prognostic statement**

The number of sophisticated software allows to comply with this tasks. However, the strict application of the formalized algorithms is time consuming and expensive. Also so called “optimum” solution changes substantially when the translation of the results of dynamic equations into practical structural sizes and function parameters. Therefore, the theory of design and years of engineering experience allowed to elaborate heuristic rules to establish functions and structures of the technological process at early stages of development with adequate accuracy to decide on further process research leading to industrial implementation. As analytical teats have shown the difference between solutions elaborated as “optimal” and obtained under heuristic rules are negligible in terms of industrial efficiency of the process. The paper will show examples of the application of the heuristic rules at three stages of the process evaluation:

a) **invention stage**
b) **establishment of the sequence of functions of the industrial process**
c) **establishment of the structure of the industrial process**

The evaluation of process parameters basically from material balance following the functional sequence and structural properties allows to evaluate the investment cost, therefore using any of available financial analysis system it is possible to predict future success of the process and product.

Topic : Instruments of support in process of transformation of invention into innovative Process

Paper N2.3 Company instruments in speeding up innovation to be applied product (provisional title)

Rafik Loufty (invited, not yet confirmed)
Xerox Corporation, Canada

Xerox Corporation is carrying out large scale program of the R&D in the organic chemistry in particular in the low tonnage, highly complex products. The successful process of transformation of the invention into innovative product supporting the main line of company profile will be shortly discussed.

Topic : Instruments of support in process of transformation of invention into innovative process

Paper N2. 4 Evaluation and comparison of the processes. (provisional title)

G. Intille, SRI Consultants, USA (invited not yet confirmed)

SRI Consultants has developed and applied methodology of the evaluation of the processes basing on the inventions (patents description). This instruments and their derivatives are giving the possibility to evaluate process in early stage of development and compare it with existing processes to confirm potential competitiveness.

Topic : Instruments of support in process of transformation of invention into innovative process

Paper N 2. 5 Technological pool - bridge between University and Industry

Alberto Nieto, Patrick Moyna
Universidad de la Republica, Montevideo, Uruguay

The demand for R&D programs in developing country like Uruguay from part of industry is substantially lower than in other countries. The reasons for such situation are multiple but two were decisive ; the protection policy and trend to buy mature technologies from abroad. But with changing situation in the field of technology are requiring establishment new development strategies for industry and therefore opening new options for R&D personnel available in local Universities in abundance. Therefore, it has been decided to establish Technological Pole in Panda in laboratories obtained by University from National Oil Company. The task of the TP will be to carry research and transform its results into innovative processes/products ready for implementation in industry or operated by industry in the frames of the TP. The TP had obtained financial support from the part of CONICYT-IDB 2 program as well as

two sub-sectors had expressed interest in participation of the R&D program in TP: pharmaceutical industry and dairy industry. The modalities of operation of the TP and participation of different staff members of University in R&D program will be shortly discussed and preliminary results reported.

Panel III

Topic : Regulatory Problems for the Implementation of Invention
Paper No 3.1 Modalities of the innovation promotion in Nigeria

Ikenna Onyido
University of Agriculture, Makurdi, Nigeria

The chemical industry in Nigeria is virtually in its infantile stage . However, there are two areas in which innovation approaches would position the fledging chemical industry to contribute meaningfully to national economic development. These are:

- **(i) The petrochemical industry: the Nigerian economy is explicitly mono-cultural in content, depending mostly on crude oil exportation for foreign exchange earning. The development of the petrochemical sub-sector has been slow in coming primarily due to the public sector involvement.**
- **(ii) The agricultural sector: With large population (ca. 120 million) the agro-industry has a huge but yet untapped potential. Studies of a basic nature in food processing technologies abound in Department of Chemistry and Food technology of Nigerian universities and polytechnics. The paper suggests modalities for enhancing activities in theses areas, by drawing from comparable experience.**

Topic : Regulatory Problems for the Implementation of Invention
Paper No 3.2 Innovation in the Japanese Chemical Industry

Makoto Imanari
Mitsubishi Chemical Corporation, Japan

The Japanese chemical industry has been facing increased competition, reduced profits. In this circumstance, Japanese government is recently going to have some plans or has conducted some plans to strengthen the Japanese industry including chemical industry. These plans include MOT dissemination, Industry-Academia alliance, Reformation and Renovation of Japanese University and National Laboratory etc. I will show about the recent Japanese government plans for strengthening the Japanese industry.

As an example, it will be shown the reformation and renovation and topics in Mitsubishi Chemical Corporation (MCC) which author works as CTO.
The talk will relate to following items.

1. **Reformation of R&D organization in MCC.**
2. **Industry -Academia alliance in MCC, MCC has now three alliances with academia, these are with University of California Santa Barbara , Kyoto University and National Institute of Advanced Industrial Science and Technology of Japan)**
3. **Some topics in innovative R&D projects in MCC**
   3-1 Green sustainable polymer which MCC is developing recently
   3-2 Examples of modeling and simulation for accelerating R&D in MCC

Topic: Regulatory Problems for the Implementation of Invention
Paper N 3.3 The role of professional societies in chemical innovation

John Malin
American Chemical Society, USA

Professional societies are providing a forum through its meetings, publications and educational activities; the professional society plays an important role in catalyzing creativity and scientific innovation. Specific programs will be discussed that demonstrate not only how a major professional society fosters communication, consensus and development of community, but also how its members introduce innovation into the Society's own programs. The author will show how the professional society fills a special niche, encouraging collaboration and development of new ideas among all components of the chemical enterprise.

Topic: Regulatory Problems for the Implementation of Invention
Paper N 3.4 The changing face of chemistry in the United Kingdom

Alan Smith,
United Kingdom

The UK chemical industry is made up of many sectors and the largest one is pharmaceuticals, which particular "global", and has excellent record of innovation, resulting from a high level of expenditure on R&D. The remaining sectors of Chemical Industry are less "global" and have a much lower level of R&D expenditure. This part of industry has seen a great deal of downsizing and re- engineering and has been actively acquired by non-UK companies. One of the main reasons for this is that it is easier to make people redundant in the UK than in most other countries, and certainly many foreign companies seek to have their R&D closer to their headquarters where they can control it more. However, all the traumatic changes in this part of the industry have created a workforce which has the advantage of being able to accommodate to change. In the UK there is a much higher proportion of specialty chemical companies than in Germany or the USA, mainly because of the UK strengths in pharmaceuticals, but, as a result, it is likely that the EU Chemical Policy White paper will have a more marked effect on UK companies that elsewhere in Europe. This is in addition to other disadvantages expressed in a recent issue of CEFIC's Barometer of Competitiveness, which highlights the fact that it is easier, cheaper and quicker to get new product into the market in the US than it is in Europe.

There has been a plethora of documents produced by interested parties in order to attempt to ensure that the UK continue to enjoy what it has benefited from - a major contribution to the balance of payments from the UK Chemical Industry. Government initiatives have been directed at topics such as lab-on-a-chip, high throughput, nanotechnology, ionic liquids, supercritical fluids etc. The UK's Foresight exercise has been regarded as the best in the world, and this has been enhanced by the creation of 24 Faraday Partnership, which have some similarities to the German Fraunhofer Institutes. Many of these Faraday Partnerships are chemical-related and much of their funding is directed at "step-change" projects.

The UK also leads the rest of Europe in the number of spin-out companies that have been initiated from universities, especially in the chemistry and materials. The vas majority of these started with Government funding in university before setting up on their own. The Royal Society of Chemistry and the Institute of materials are both

helping these companies to flourish, as well as encouraging other academics to take the plunge. The focus and emphasis is on innovation, with patented technology.

Topic : Regulatory Problems for the Implementation of Invention
Paper No 3.5 Necessary policy measures to speed up innovation promotion in EU countries

Humphris Colin
CEFIC, Belgium

CEFIC in its Barometer of Competitiveness has identified the distortions in the process of innovation dissemination in the EU countries due to the exaggerated regulatory measures in regard to the introduction of the new processes and products to the market. Paper will concentrate on the authors' experience of the process of innovation from science to profitable business. It will draw on the work of the Chemicals Innovation and Growth Team 2002 in the UK where recommended new ways forward for the industry in UK. The conclusions will be given why the efforts of the UK Government fall short for the chemical industry. This will be related to the EU Commission's Framework of 6 Program in regard to the to stimulation of the innovation. Improvement of the situation and achievement of the standards of other regions e.g. USA requires special policy measures to be adopted to promote innovations through more intensive implementation of inventions remaining at present at the shelves. Paper will present number of obstacles and propose changes in regulatory measures.

Topic : Regulatory Problems for the Implementation of Invention
Paper No 3.6 Chemical Education and Chemical Industry in Turkey

Ayhan Ulubelen
Faculty of Pharmacy, University of Istanbul;
Member of Turkish Academy of Sciences, Turkey

Chemistry was given as service lectures to Medical and Engineering students during the 18th and 19th centuries (from 1714) in Turkey (Ottoman empire period). The School of Chemistry was started with 3 students in 1918. Now in the year 2003 in 78 Universities about 50 Chemistry and Chemical Engineering Faculties there are thousands of Chemistry students.

Turkish scholarly publications have increased continuously during the last 23 years. In 1980 there were approximately 250 papers, in the year 2002 this number became 9321 almost 38 times increase. From the 45th place Turkey has elevated to 22 place according to Science Citation Index.
Chemistry publications takes a high place in this number.

On the other hand Chemical industry has started in 1911 with the opening a cement factory near Istanbul. The push for industrialization came with the Turkish Republic founded in 1923. Since the private sector had not enough capital and knowledge the State has founded almost all basic industrial plants. After 1950's the private factories started first slowly , later rather fast, almost in every field . Turkey could be considered a pretty good industrialized country. The Pharmaceutical plants were the first in chemical industry, now paint, detergents, oil and its various preparations, plastic etc. were included.

But, one has admit that there was not much interaction between the Industry and Academic world in the field of Chemistry.

DISCUSSION: EXPECTED OUTCOME OF THE CONFERENCE

The following outcome of the Conference is expected:

1) **Conference proceedings**
2) **Recommendations in specific topics of innovation implementation procedures and instruments to be distributed through Chemistry International as well as through other chemistry and engineering papers world wide.**
3) **The better understanding of the Government and Regional officials in regard of the challenges and obstacles of the innovative process.**
4) **Recommendations to the Governments and regional officials in regard to the needs of special de-regulations or legislative initiative.**

THE REGISTRATION FORM FOR THE PARTICIPATION IN CONFERENCE AS WELL AS SPEAKERS LEAFLET ARE ATTACHED.

CHEMRAWN Consultation Forum *
Innovation - way from pure to applied chemistry
PARTICIPANT REGISTARTION FORM

Name and first name………………...

Nationality………………………………………………………………

Address telephone, fax, including e-ail..
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Position…………………………………………………………………

Professional orientation (branch of chemistry)………………………………..

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