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Seminar on the Development of a Prospective International CRM Network in Conjunction with APMP TCQM Gas Working Group Workshop

Korea Research Institute of Standards and Science(KRISS)

October 13~16, 2003

한국표준과학연구원
KOREA RESEARCH INSTITUTE OF STANDARDS AND SCIENCE

KOREA AGENCY FOR TECHNOLOGY AND STANDARDS

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Asia Pacific Metrology Programme

SEMINAR
ON THE DEVELOPMENT OF A PROSPECTIVE INTERNATIONAL CRM NETWORK
IN CONJUNCTION WITH
APMP TCQM GAS WORKING GROUP WORKSHOP

Korea Research Institute of Standards and Science (KRISS)
October 13 ~ 16, 2003

ORGANIZED BY
KOREA RESEARCH INSTITUTE OF STANDARDS AND SCIENCE (KRISS)
KOREA AGENCY FOR TECHNOLOGY AND STANDARDS (KATS)

SPONSORED BY
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)
APMP TECHNICAL COMMITTEE FOR AMOUNT OF SUBSTANCE (TCQM)
APMP AD-HOC WORKING GROUP FOR THE EVALUATION OF MATERIALS PROPERTIES

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APMP AD-HOC WORKING GROUP FOR THE EVALUATION OF MATERIALS PROPERTIES

October 13 (Mon)

09:30 ~ 09:40	Welcome address Dr. In Won Lee, Vice President Korea Research Institute of Standards and Science (KRISS)
09:40 ~ 09:55	*Introduction of UNIDO Program on Capacity Building in Technology Diffusion and Market Access* Mr. Vladimir Kozharnovich, Program Manager, Industrial Promotion and Technology Branch, Programme Development and Technical Cooperation Division, UNIDO
09:55 ~ 10:10	Introduction of the Project Dr. Gun Woong Bahng, Principal Researcher, Division of Chemical Metrology and Materials Evaluation, Korea Research Institute of Standards and Science (KRISS), Korea
10:10 ~ 10:20	Group Photograph
10:20 ~ 11:20	Invited Lecture (I) Dr. Doris Florian, Unit Head, European Commission, Joint Research Centre, Institute for Reference Materials and Measurements (IRMM), Belgium

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PHONE: +82 42 868 5442 FAX: +82 42 868 5444 HTTP://WWW.KRISS.RE.KR

11:20 ~ 12:20	Invited Lecture (II) Dr. Hun Young So, APMP TCQM Chair/Principal Researcher, Division of Chemical Metrology and Materials Evaluation, Korea Research Institute of Standards and Science (KRISS), Korea
12:20 ~ 13:30	Lunch
13:30 ~ 14:00	Country Report Presentation Prof. Yadong Yu, Director, National Research Center for Certified Reference Materials (NRCCRM), China
14:00 ~ 14:30	Country Report Presentation Ms. Chin-I Huang, Chemistry Associate Researcher, Measurement Standards & Technology Division, ITRI Center for Measurement Standards (CMS), Chinese Taipei
14:30 ~ 15:00	Country Report Presentation Dr. Koichi Chiba, Deputy Director, National Metrology Institute of Japan (NMIJ)/AIST, Japan
15:00 ~ 15:20	Break
15:20 ~ 15:50	Country Report Presentation Dr. Laurie Besley, Project Leader, Chemical Metrology, CSIRO National Measurement Laboratory, Australia
15:50 ~ 16:20	Country Report Presentation Dr. Jin Seog Kim, Principal Researcher, Division of Chemical Metrology and Materials Evaluation, Korea Research Institute of Standards and Science (KRISS), Korea

16:30 ~ 17:30 Lab Visit (Materials Evaluation Center, Organic and Inorganic Analysis Labs)

- 18:30 ~ Welcome Dinner

October 14 (Tue)

09:00 ~ 10:30 Round Table Discussion I
(Development of an International Network of CRMs)

10:30 ~ 10:50 Break

10:50 ~ 12:00 Round Table Discussion II
(Development of an International Network of CRMs)

12:00 ~ 13:00 Lunch

APMP TCQM Gas CRM Workshop

13:00 ~ 13:10 Welcome address
Dr. Hun Young So, APMP TCQM Chair

13:10 ~ 13:20 Welcome address
Dr. Hyeong-Ki Choi, Director, Korean Agency for Technology and Standards (KATS), Korea

13:20 ~ 13:30 Introduction of the Gas CRM Workshop
Dr. Jin Seog Kim, Principal Researcher, KRISS

13:30 ~ 14:00 *A standard reference photometer for the measurement of Ozone in KRISS*, Dr. Jin-Chun Woo, KRISS (Korea)

14:00 ~ 14:40 *Gravimetric preparation of reference gases by a new balance*, Dr. Nobuhiro Mastumoto, NMIJ (Japan)

14:40 ~ 15:00	Break
15:00 ~ 15:40	*Calibration gas mixtures of water in nitrogen preparation by a dynamic volumetric method. A new quick method to determine the micro-trace water in highly purified gases*, Dr. Zeyi Zhou, NRCCRM (China)
15:40 ~ 16:20	*High purity gases*, Dr. Kenji Kato, NMIJ (Japan)
16:20 ~ 16:40	Break
16:40 ~ 17:20	*The traceability system for the quantity of gas composition*, Prof. Yadong Yu, NRCCRM (China)
17:20 ~ 18:00	*Reliability and accuracy of self-made standard gases by Deokyang Energen*, Dr. Taeck-Hong Lee, Deokyang Energen Corp., (Korea)

October 15 (Wed)

09:00 ~ 09:40	*VOC (K-22) preparation*, Mr. Tetsufumi Harusue, CERI (Japan)
09:40 ~ 10:20	*Primary standard for green house gas mixtures in Korea*, Dr. Jin-Seog Kim, KRISS (Korea)
10:20 ~ 10:40	Break
10:40 ~ 11:20	*Recent activities in special gas mixtures at CSIRO/NML*, Dr. Laurie Besley, CSIRO/NML (Australia)
11:20 ~ 12:00	Representative from Taipei (I)

12:00 ~ 13:00	Lunch
13:00 ~ 13:40	Representative from Takachiho (Japan)
13:40 ~ 14:20	Representative from Taipei (II)
14:20 ~ 14:40	Break
14:40 ~ 15:20	*Laboratory accreditation system in Korea*, Dr. Gyung Ihm Rhyu, KATS (Korea)
15:20 ~ 16:00	*JCSS system for gas metrology*, Mr. Masaaki Maruyama CERI (Japan)
16:20 ~ 17:00	*Activity of ISO TC in Korea*, Dr. Airan Han, KATS (Korea)
17:00 ~ 17:20	Break
17:20 ~ 18:30	Round Table Discussion (Bilateral Comparison of Gas CRMs)

- 18:40 ~ Farewell Dinner

October 16 (Thu)

09:00 ~ 14:00	Technical visit (Gas Science Museum, Incheon)

Wednesday, 9 October 2002

Session II: Funding opportunities for technologically oriented projects from Central European Countries

9.00 – 9.30 Opening remarks: Mr. V. Calogero, Head of CEI/EBRD Project Secretariat

9.30 - 11.00

- World Bank assistance programmes (Mr. Rorry O'Sullivan)
- Basis of the financial policy of the International Financial Corporation-World Bank in CEI countries
  (Mr. Roberto Albisetti)
- Basis of the financial policy of EBRD (Mr. Henry Russell)

11.00 - 11.30 Coffee Break
Press Conference

11.30 - 13.00

- EU programmes (Assistance programme for SME development of European Agency for Reconstruction)
  (Mr. David Miller)
- Assistance provided by UN agencies (UNDP,UNIDO)
- Financial policy of Italian donor institutions, FINEST,SIMEST, INFORMEST, MAE-Cooperazione allo Sviluppo (Ms. Schineanu)

13.00 Lunch-Break

15.00 – 16.00 Discussion
16.00 - 17.30 Presentation of the 5th CEI Summit Economic Forum (Mr.V.Calogero)
17.30 - 18.00 Conclusions and closing of the Seminar

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PROGRAMME

Tuesday, 8 October 2002

8.00 - 9.00 Registration

9.00 - 10.00 Opening addresses by:

- YU government representative (Deputy Minister for Foreign Affairs, Ms. J. Minic)
- Ambassador of Italy in Belgrade (Charge d'Affairs. Mr. R. De Cardona)
- ICS-UNIDO Managing Director (Mr. F. Pizzio)

10.00 - 10.30 Symposium scope and expected results (Mr. G. Cicognani/Ms. M.Holodkov)

10.30 Coffee break

Session I: Assistance in technology transfer and adaptation for SME clusters
(Chair: Mr. Nenad Penezic, Managing director of Serbian Agency for SMEs development, Yugoslavia)

11.00 - 11.15 Opening remarks by
Mr. Vlahovic, Minister for Privatization of the Republic Serbia

11.15 - 13.00

- Ms. Giovana Trombetti, Province of Bologna: How to increase the efficiency of the local industrial system through creation of new SME. Presentation of the Programme "Creare un'impresa"
- Mr. M. Bianchi, University of Bologna: The use of the modern informative systems in the SME creation phase
- Mr. Angelo Neri, Province of Bologna: The identification of the new methodologies of management, market evaluation (international and local)
- Mr. Enrico Santarelli , University of Bologna: The importance of professional education related activities for the SME management
- Ms. Federica Roffi, Assistant of General Director of ASTER (Agenzia per lo Sviluppo Technologico dell'Emilia-Romagna): The Role of ASTER in SMEs promotion in the general framework of the ERVET system
- Mr. Nerio Bentivogli, Province of Bologna: Support and promotional activities of the Province of Bologna for helping SMEs development.
- Mr. Giangiuseppe Bentini, CNR: The importance of establishing a cluster-based structure of SMEs as a major step in the direction of an industrial district.

13.00 Lunch Break

15.00 - 17.00 Roundtable discussion (moderator Mr. G. Cicognani)

7. BASIC DOCUMENTATION

- Agenda of the Seminar
- List of participants
- Aide-memoire
- Abstracts of contributions
- Promotional material for CEI Summit Economic Forum 2002

8. TIME AND VENUE

The Seminar will be held in Belgrade, Yugoslavia, at the premises of the Yugoslav Chamber of Commerce, 23 Terazije , 8 - 9 October 2002.

10. LANGUAGE

The language of the meeting will be English.

11. FINANCIAL ARRANGEMENTS FOR ICS SUPPORTED PARTICIPANTS

For invited participants from CEI countries, travel and living expenses will be covered by ICS-UNIDO. Participants representing industries will participate at their own expense.

Travel expenses:
Following UNIDO travel standards, tickets by the most direct and economical route will be reimbursed. Pre-paid tickets can be issued where necessary. Participants who need a prepaid ticket should contact the ICS Secretariat as soon as possible.

Living expenses:
For all invited participants, lodging and meals will be organized and covered by ICS (covering living expenses during the attendance of the Seminar).

Participants will be required to bear the costs of all expenses in their home country incidental to travel abroad, including expenditure for passport, visa, and any other miscellaneous items as well as internal travel to and from the international airport of departure in their home country.

The organization will not be responsible for any of the following costs that may be incurred by the participants while attending the symposium:
- compensation for salary or related allowances during the period of the Seminar
- any cost incurred with respect to insurance, medical bills and hospitalization fees
- compensation in the event of death, disability or illness
- Loss or damage to personal property of participants while attending the Seminar.

12. VISA ARRANGEMENTS

Participants are requested to arrange for their visa, if required, as early as possible at the embassy in their home country. In case of difficulties, please advise the contact persons mentioned below.

development of project ideas to be presented to the donor community, including international organizations, financial institutions, and potential investors. The following months will allow the development of these proposals, establishment of pilot schemes and the necessary partnerships for participation in internationally supported programmes, particularly those of the European Union.

5. STRUCTURE OF THE PROGRAMME

The Seminar will take place in Belgrade and will be organized in two plenary session based mainly on 15-minute presentations. The first session will be focused on the needs of local SMEs and large manifacturing companies; the second session will be devoted to the reports of selected international financial institutions which will present existing capacities, procedures, successful cases and lines of future development.

The audience is expected to interact and help to identify local technological requests and ideas that have regional interest. For this reason, two target beneficiary groups are expected to take an active role: representatives of SMEs and representatives of public enterprises and large companies.

A roundtable discussion will be organized in the afternoon of the first day in order to give the participants the opportunity to express their particular needs and requirements for assistance from the service centres.

A poster session will be organized in parallel, for the presentation of the most interesting projects as well as the exhibition of products and services dedicated to SME partnership promotion.

The follow-up of this Seminar is expected to be promoted during the CEI Summit Economic Forum that will take place in Skopje, Macedonia from 13 to 15 November 2002. In this occasion the conclusions of the work started in Belgrade will be presented and further developed during the following months, that is, concrete proposals for funding, requests for joint venture partners and investors to complete various project packages, presentations of requests to financial institutions, statements of government support, etc. This promotion will be connected and carried out through related facilities within the CEI Summit Economic Forum.

6. PROFILE OF PARTICIPANTS

The Seminar is intended for participants from SMEs, industry and governmental institutions with expertise and interest in the territory related aspects of sustainable technological development.

The target beneficiaries of this initiative are all kind of policy and decision-makers: those at national government level involved in European integration processes; local policy-makers creating the environment for investment opportunities and industrial transformation and privatization; SME entrepreneurs aware of the need to exploit local and international R&D institutions.

The expected participation is in the order of 150 participants, including about 30 invited guests from Italy and countries within the region of South-east Europe (Albania, Bosnia Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Yugoslavia).

Preference will be given to participants who are actively involved, in their home countries, in programmes related to R&D or industrial production connected with the present issues as well as to experts involved in international associations and networks.

- provision of technical assistance for the creation of a service centre in Kragujevac as a case study based on the particular request received from the Serbian government and the local authorities
- promotion and application of the service centre model in other parts of the Central European region
- provision of information for cooperation with international financial institutions (IFI) through the clarification of project application procedures
- dissemination of information on and instruction of SMEs in the necessity of the preparation of transparent financial reports and strategic business plans, according to the requirements of IFI and Italian financial institutions such as Cooperazione allo Sviluppo, FINEST, SIMEST, INFORMES
- eligibility of public enterprises and large local industries in the region in applying to the various donor tenders
- Presentation and promotion of the ICS potential in supporting the industry development programmes and offering specialized technical services/assistance in project formulation and promotion related activities.

The Seminar will also be an opportunity to establish direct contacts in view of possible joint ventures and to create networks for the dissemination of the necessary information

4. OUTPUTS

The main outputs of this Seminar can be divided into those having a more strategic character in line with ICS and CEI mandates , and those of specific value for national SMEs systems.

General outputs are:

➢ Increasing of ICS visibility and of its activities carried out for the benefit and sustainable technological development of countries in South-east Europe.

➢ Identification of a number of project ideas to be developed during the following months on a regional or sub-regional basis, at the required level (conceptual, pre-feasibility, feasibility) to be proposed to the potential donors, and then put forward for funding, to allow their implementation.

➢ Transfer of knowledge and capacity-building of local SMEs and industry, to increase competitiveness in respect to the preparation of projects and programmes eligible for funding by international donors.

➢ Conclusions and recommendations for the relevant high-level meetings to be organized by CEI and the Adriatic-Ionic Initiatives during 2002 (in particular the Summit Economic Forum).

More specific outputs can be summarized as follows:

- the way to increase the efficiency of SMEs and helping the creation of new enterprises
- identification of new methodologies of management and market evaluation (both international and local)
- procedures needed to assure a proper quality assurance of the products and related certifications
- practical use of modern informatic systems at the service of enterprises
- adaptation of specific country conditions to a reference framework which assures proper cooperation between local authorities, S&T institutions and SMEs
- identification of the duties to be appointed to a typological service centre for a number of SMEs co-operating at the territory level along a well established production line.

The Seminar will conclude with a strategy for the development of the sector, differentiated by country, but focused on the benefit of regional co-operation. It will also contain a plan of action for the

continuing collaboration and joint support for the benefit of CEI countries. The new programme for 2002 is oriented towards technical assistance to SMEs, particularly through networking activities, technology innovation and dissemination of information, advisory/decision support services for technology transfer, training and consulting services on project formulation and funding opportunities, all for the benefit of CEI countries.
The guidelines of the joint activities have not changed and will be focused on:

- sustainable technological development of the region,
- bottom up approach in identifying the most important projects to be promoted,
- orientation to cross border cooperation and regional economic development,
- information society as a factor of development.

Specific attention devoted to the proper development of the SMEs system is fully coherent with the guidelines outlined above. On one hand it is recognized that SMEs play a major role in any territory related sustainable development policy, on the other, their competitiveness on the market - at both national and international level – call for proper use of new technologies which are product/process oriented to the research of an increasingly efficient co-operation/association approach among themselves and, towards political and institutional environments.

For this reason the International Centre for Science and High Technology (ICS-UNIDO) and the Central European Initiative (CEI) are jointly organizing a seminar aiming to provide assistance in technology transfer/adaptation for SME clusters and to propose advanced and validated organization/management related models. The Seminar will be followed by an "ad hoc" session focused on providing practical assistance in understanding the main funding opportunities for the realization of technologically oriented projects

The Seminar will also be an occasion for understanding the requests and the ideas coming from the representatives of local operators (industry, SMEs, R&D and government institutions) of South-east European countries. It should also be considered an activity, which represents a logical follow-up of the initiatives started last year when a series of 17 workshops were organized for the benefit of countries of the region. Moreover, it is intended as a preparatory event for the CEI Summit Economic Forum to be held in Skopje, Macedonia in later this year.

3. OBJECTIVES

The overall objective of the Seminar is fully coherent with the request of the Central European countries to provide more clear information on the SMEs development based on the experience gained by the developed European countries, in particular by Italy. For this reason it is intended to present the Italian model of promoting the SMEs development, with a specific attention to the support assured by both local administrations and national governmental institutions to the process of clustering the SMEs along specific, market oriented production lines.

On that basis a main objective of the Seminar is to present the potentiality of SMEs in a more general industrial and economic development frame, underlining the importance of implementing proper promotional and management related policies by both national governments and local administrations.

More specific and particular objectives of the Seminar are:

- awareness building on the necessity of creating clusters of SMEs
- identification of a suitable Italian model that would be applicable to assist and support institution acting as coordinators of SMEs development on the national level

1. BACKGROUND

ICS Overview

The International Center for Science and High Technology (ICS) is an autonomous institution within the legal framework of the United Nation Industrial Development Organization (UNIDO), with headquarters in Trieste, Italy.

The Centre's mandate is sustainable industrial development through the transfer of know-how and technology from developed to developing countries. The background to this mandate is the recognition that a competitive industrial and technological capability cannot be built-up without adequate scientific knowledge and without participation in the development and utilization of new and advanced technologies.

ICS' target beneficiaries are identified among scientists, researchers and technologists within industrial R&D institutions, clusters of science-based industries and/or industries with their own R&D facilities. However, close cooperation with the industrial sector is sought either through direct interaction with SMEs or through the provision of technical assistance and scientific services in cooperation with selected R&D institutions.

Focus on Central/East European Region

Following the requirements of its institutional mandate as well as the policy of both UNIDO and the Italian Ministry of Foreign Affairs, ICS is seeking to find solutions to the individual requirements and needs of the particular beneficiaries in the context of international industrial co-operation programmes. In that respect, the new ICS Work Programme 2002-2004 underlined the strategic objective of improving the industrial competitiveness of countries where economic development is under way, including those facing the complex transition phase from the centrally planned to market-oriented economies. Thus the region of Central and East Europe (CEE) represents a clear interest for ICS activities as well as a challenge in promoting the endogenous capacities of the beneficiaries (SMEs, national institutions, governments, etc.) of those countries.

Both the scientific/technological content of the ICS Work Programme 2002-2004 and the specific attention of ICS towards CEE countries calls for support of the Centre for the co-operative programmes promoted by Italian government in this region, with specific reference to CEI (Central European Initiative), AII (Adriatic-Ionic Initiative), the priorities of Cooperazione allo Sviluppo etc. Important synergies can be clearly identified, thus stressing the opportunity of a common implementation of selected projects focused on territory related sustainable development.

2. JUSTIFICATION

ICS-UNIDO and CEI co-operation is based on the mutual objective of promoting sustainable development, thus bringing stability to the region. This development takes into consideration environmental constraints, social needs and the economic potential of the region. The partnership aims to achieve this through holding joint activities such as workshops and training programs, the identification of technology demand and the provision of the necessary assistance and services requested by member countries.

ICS-CEI co-operation formally started in the year 2000. After achieving positive and beneficial results, both parties agreed to increase this collaboration in 2001, the year of the Italian Presidency of CEI. A total of 600,000 EURO was spent on activities benefiting CEI countries (the high priority was given to the training of 633 young experts) and the identification of 25 project proposals to be submitted for financing. Taking into account the results obtained in the previous years as well as the request of the highest political representatives of CEI member states, the two institutions are

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY

with the contribution of
the Central European Initiative

CEI
CENTRAL EUROPEAN INITIATIVE

Aide-Mémoire

Seminars on
Assistance in technology transfer and adaptation for SME clusters
and
Funding opportunities for technologically oriented projects from Central European countries

in collaboration with:

the Ministry of Foreign Affairs of the Federal Republic of Yugoslavia
the Yugoslav Chamber of Commerce
the Serbian Agency for the Development of Small and Medium-sized Enterprises
APRI - Agency for R&D Promotion, Belgrade

Belgrade, FR Yugoslavia, 8 – 9 October 2002
in preparation for the CEI Summit Economic Forum
Skopje, Macedonia, 13-15 November 2002

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Why Certified Reference Materials are Essential for Materials Metrology?

WHY CERTIFIED REFERENCE MATERIALS ARE ESSENTIAL FOR MATERIALS METROLOGY?

G. W. Bahng
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Abstract

With the emergence of the WTO system, the alignment of standards in testing, calibration and accreditation has become one of the critical problems to establish worldwide free trading system. Particularly, the importance of conformity assessment in trade was already noted in the 1994 agreement on Technical Barriers to Trade. In 1999, 38 National Metrology Institutes signed a Mutual Recognition Arrangement at BIPM. In order to secure the equivalence in calibration among the NMIs who signed on the MRA, BIPM launched a program known as 'Key Comparison'. In 2001, laboratory accreditation bodies of ILAC signed MRA to promote the acceptance of test and calibration data. The aim of the ILAC MRA is to develop a global network of accredited testing and calibration laboratories to realize the dream of tested once and accepted everywhere.

Having recognized the vital importance of materials measurement and testing technology in trade, the G7 countries already initiated in 1987 a multilateral program known as the Versailles Project on Advanced Materials and Standards (VAMAS) and they have been cooperating each other for the last 15 years. Now it became a worldwide concern with the increase of trade in material products and it is no more a problem that could be dealt by the G7 countries only. Recently, APMP approved to set-up ad-hoc working group in materials properties evaluation to promote development of standards in materials testing and standardization through international cooperation. These activities could be interpreted as a part of worldwide effort to establish standards for materials metrology. In this paper the importance of CRMs to provide standards for materials metrology is discussed.

1. Background

With the emergence of the WTO system, the alignment of standards in each country and other metrological issues, including testing, calibration and accreditation have became one of the critical problems to establish free trading system in world economic

order. This is because differences in standards and certification requirements from one country to another can act as "Technical Barriers to Trade". Particularly, the importance of conformity assessment in trade was already noted in the 1994 agreement on Technical Barriers to Trade (WTO TBT agreement). In view of globalization of world economy, the removal of technical barriers to trade is a problem to be tackled by international communities since it requires harmonization in legal regulations, documentary standards, accreditation system, etc.

In October 1999, the 38 directors of the National Metrology Institutes (NMIs) of the world signed a Mutual Recognition Arrangement (CIPM MRA) of national measurement standards and of calibration and measurement certificates issued by the NMIs. In order to secure the equivalence in calibration among the NMIs who signed on the MRA, BIPM launched a program known as 'Key Comparison'. It is still going on and expected to be finished by the end of 2005 in 350 fields of measurements.

Two years later, in April 2001, 38 laboratory accreditation bodies of the International Laboratory Accreditation Cooperation (ILAC) signed MRA (ILAC Arrangement) to promote the acceptance of test and calibration data issued by accredited laboratories. The aim of the ILAC MRA is to develop a global network of accredited testing and calibration laboratories that can be relied on to provide reliable results and ultimately to realize the free-trade goal of "a product tested once and accepted everywhere".

It is evident that such MRAs provide technical underpinning to international trade. Furthermore CIPM and ILAC exchanged a MOU in November 2001 to cooperate together, which means that NMIs should take care about the traceability chain not only in calibration but also in test and inspection. Needless to say, standards can be disseminated more effectively and systematically to the end user of the industry through the accredited test laboratories.

According to the ISO/IEC 17025, "General requirements for the competence of testing and calibration laboratories", which was adopted in 1999 with the revision of ISO/IEC Guide 25, it is required to evaluate uncertainty even for test results which was optional before. Therefore, the evaluation of uncertainty becomes important not only for calibration laboratories but also for testing laboratories because the uncertainties of test data can be used as an indicator of the quality of test results. As a matter of fact, most of the testing subjects are closely related to materials properties and in this sense, it is really urgent to develop standardized testing procedures of materials properties, uncertainty evaluation program and Certified Reference Materials (CRMs) with much narrower uncertainty band than ever before. These activities will contribute to the

production of reliable test results.

2. Problems in Materials Evaluation

Until this time, international cooperation for the development of standards to evaluate materials properties was not so active except the VAMAS program. Many researchers in materials science and engineering are concerned with the development of advanced materials itself and very few people care about the traceability of measurement standards of testing methods and the quality of the test results. It is quite surprising when we consider the fact that materials-related products occupy considerable portions of world trade.

In fact, there exist so many parameters affecting the materials performance and properties that it is quite difficult to develop the most suitable and standardized methods of evaluation. It is because materials properties depend not only on the chemical composition but also on phase and structure. This makes the evaluation and characterization procedure of materials quite unique and difficult. As a result, the uncertainty range of measurement or test results on the properties of materials is usually quite large and sometimes reaches up to percentage order.

For example, the uncertainty range of the standard reference materials for impact test is about 10 percent range. Same example can be found in the thermal properties-related CRM from USA and Europe those are known to be the world best. The difference in the reference values between these two sources is about 2 %, and it is really large compared to the physical standards in which ppm order is reported for the uncertainty of the measurement data. Hence it results in poor confirmation of compatibility among the participating institutes in materials testing. In addition to this, the difference in test data among the different test methods is so large that it is nearly in the range of ~10 %.

In addition to this, different test procedures, in many cases, are applicable only depending on the targeted materials, which causes a restriction to the general use of test data. This means that materials properties are not measurement method independent measurand. This is one of unique characters of materials properties. For example, the strength of materials, in the unit of N/m^2, emergies in the line of traceability chain up to force and length. This is a unit of pressure and the strength of materials has the same unit. Pressure is measurement method independent, however, strength is not. Materials strength is quite different depending on the measurement method or condition of measurement. As a result, standards for materials properties evaluation should be provided in the middle of the traceability chain. Because of this fact, CRM is used not

only as a tool for dissemination of standards but also to provide standards itself.

3. Standards on Materials Properties Evaluation

Metrology is defined as a "science of measurement" and it covers three main tasks. Those are the definition of internationally accepted units of measurement, the realization of units of measurement by scientific measurement, and the establishment of traceability chains in documenting the accuracy of a measurement.[1] These can be expressed in other words as the reference procedure, reference machine, and reference materials with uncertainty, respectively. For the materials metrology, there is a uniqueness to be considered for lay down of fundamental of traceability chain. Let's think about it in detail.

Materials properties can be grouped broadly into 6 categories. They are respectively mechanical properties, thermal properties, chemical and biological properties, electric and electronic properties, magnetic properties, and optical properties. In addition to these categorized properties, methods for the evaluation of micro/nano-structure, crystallography, and surface/interface analysis are necessary to obtain full information and understanding on the behavior of materials. Regarding the setting up of standards for the evaluation of these properties, the question about 'standard' should be discussed in depth among other things.

In most cases, the 'standard' is adopted on the basis of the natural phenomenon that is not affected by environmental conditions and measurement methods. For example, the light of speed or melting point of gold is used to set up the length or temperature standards, respectively, since they are independent on measurement methods. Hence it can be used as a 'standard' for specific unit. The only difference in the result is accuracy even different measurement methods are applied

For the case of materials properties evaluation, the test results are very much sensitive to the test procedure in many cases and hence well defined measurement method and test procedure is more important to obtain consistent and reliable results rather than the standard itself. Therefore the first step to establish materials standard is standardization to define reference procedure. The next step is realization of this reference procedure. For this purpose, reference machine is required which has far better degree of accuracy and reliability compare to the commercial grade machine. And then CRM is necessary to disseminate the standard to industry. Reference procedure, reference machine, reference materials are those three essential components to establish materials standard. With this basement of measurement standard, materials metrology

could be constituted.

For example, even though most of the NMIs maintain hardness 'standard', there is no real standard in hardness. There is no way to derive the hardness unit, e.g. HRC, HV, from those units, i.e., Newton and mm. Hardness is not independent on the test procedure. As a result, the test procedure actually defines the 'standard' of hardness and NMI needs standard hardness testing machine to realize this procedure. Hardness standard can be disseminated with hardness reference block.

Standard in chemical analysis is another example in which the test procedure itself is an actual 'standard' in the sense that the quality of the data depends mainly on the procedure. In principle, chemical composition measurements are traceable to the SI unit for the amount of substances of the chemical species. However, due to the possible losses during sample preparation, chemical interferences, matrix effects and uncertainties associated with such measurements, the traceability to the SI unit is often very difficult to achieve in practice. Because of this, Consultative Committee on Quantity of Mass (CCQM) under CIPM was established to obtain a secure chain of traceability in chemical analysis. Also this is the reason why the names of those working groups under the CCQM are based on the measurement methods such as organic analysis, electronic analysis, inorganic analysis, etc., rather than measurand itself such as working groups under CCM, i.e., mass, pressure, density, force, etc.

4. CRMs

Reference materials for the use of calibration and validation of test methods are necessary to achieve metrological traceability. CRMs can act as the traceability link to the International System of Measurement (SI). By the application of a CRM, it is possible to assure whether the measurements have been properly carried out to the required level of accuracy. Also CRM provides "measurement benchmarks" so that comparability of results can be ensured. The role of CRMs is especially very important when the test results are heavily affected by the test procedures as is the case in chemical analysis and materials properties evaluation. Actually, CRM is the standard itself practically when materials properties are related.

To reduce the uncertainty in measurement of materials properties and to improve the traceability chain to the SI unit, wide application of materials properties-related CRMs is necessary as in chemical analysis. In addition, regular proficiency test is required to assure the reliability and ability of the accredited laboratories according to the ISO/IEC 17025. That is why the demand on the reference materials is increasing for proficiency

[1] *Metrology in Short*, Euromet project no. 595, p. 9 (October 2000)

test, especially high quality and homogeneous reference materials.

Even though the demand on high quality CRMs are increasing, development of CRM is very time consuming and expensive project to be handled by one economy. Material properties depend not only on the chemical composition but also microstructure. The crystallographic nature of phase that constitutes the microstructure is usually measured by X-ray analysis. Problem lie in the fact that precise quantitative measurement and control of microstructure is almost impossible, which in turn, causes difficulties in development of highly uniform and reliable reference materials.

So the CRMs available for materials properties usually show quite large scattering range of data compare to the CRMs for physical measurement standards due to poor level of control of microstructure. The problem is, who will develop it and who will CERTIFY it? To resolve this problem, international cooperation is necessary and there should be a focal point to harmonize all of these activities.

5. Acitivities of VAMAS

Having recognized the vital importance of materials measurement and testing technology in trade, G7 countries agreed to initiate a multilateral program, Versaille Project on Advanced Materials and Standards (VAMAS) at the Versaille G7 summit held in June, 1982. This project formally started from 1987. The purpose of this project is to offer a technical foundation for standardization of advanced materials properties evaluation in order to promote international trade in advanced materials and related products.

Activity of VAMAS is performed by Technical Working Area (TWA). 28 TWAs have been installed since the start of VAMAS and 9 fields of TWAs has already completed their activities and now there are 20 TWAs in operation. Table 1 shows the results of VAMAS activities and as it can be seen, most of them are document standards.[2]

Table 1. Summary of standards initiated by VAMAS TWAs.

TWA	Standards	SRM
1. Wear test methods	CEN : 1	
2. Surface chemical analysis	ISO :11, ASTM : 2	
3. Ceramics for structural applications	ISO : 5, CEN : 8, ASTM : 4, JISC : 2	NIST : 3
5. Polymer composites	ISO : 3	
13. Low cycle fatigue	ISO : 4, BSI : 1, JISC : 1	

[2] J. Early, VAMAS contribution to Standards Development, VAMAS Bulletin, No. 24, pp. 12-16 (2001)

14. Unified classification system for advanced ceramics	ISO : 1, CEN : 1, ASTM : 1	
16. Superconducting materials	IEC : 8	
17. Cryogenic structural materials	ISO : 1	
21. Mechanical measurements for hardmetal	ISO : 1	
22. Measurements of thin films and coating	ISO : 3, CEN : 1	
25. Creep/fatigue crack growth in components	BSI : 2, ASTM : 2	

ISO : International Organization for Standardization

IEC : International Electrotechnical Commission

CEN : European Committee for Standardization

ASTM : American Society for Testing and Materials

JISC : Japanese Industrial Standards Committee

BSI : British Standards Institution

NIST : National Institute of Standards and Technology

Now it became a worldwide concern with the increase of trade in material products and it is no more a problem that could be dealt by the G7 countries only. VAMAS opened the door to the world so that any institute can participate in the TWA activity, however, the steering committee is still composed of G7 countries and hence it can not be regarded as a worldwide international body. In addition to this, VAMAS activity is concentrated mainly on the ISO documentation and activities in proficiency test and development of CRMs are relatively weak. Worldwide cooperation to establish standard for materials properties measurement, which is the fundamental of the materials metrology, is on strong demand and development of CRM is one of essential activities.

6. Activities of APMP and APEC – Organization of ANMET.

In November of 2001, the 17th APMP general assembly was held in Tsukuba, Japan. At the meeting Korea proposed an agenda about the establishment of a working group on the materials properties evaluation. After discussions on the need of the working group, APMP endorsed the establishment of Ad-hoc Working Group of Materials Properties Evaluation. The working group can be a focal point for international cooperation in APMP to overcome problems related with materials properties evaluation.

Besides of this organization of Ad-hoc Working group, KRISS has been carrying a project with financial support from APEC and Korean Government to lay a basis for international cooperation in materials evaluation in the APEC region. The first stage of the project is to formulate a cooperative framework among member economies in the

field of materials evaluation technology and to lay down a fundamental in materials properties evaluation to support free trade in the region. It was established officially in 2002 and the name of the network is "APEC Network for Materials Evaluation Technology". The areas of cooperation of the network can be categorized as follows.

- Carrying out regional key comparison in materials properties
- Development of protocol for proficiency test
- Development of CRMs
- Round robin test for pre-standardization
- Seminar and workshop for human resource development and technology transfer

Almost all of the related institutes of the member economies have joined in this network. At this time, there are 14 member institutes from 12 economies. The member institutes agreed to serve as a joint member for ANMET and APMP ad-hoc working group. These are the summaries of the object of the network.

Objectives

- Building up technological cooperation through the establishment of a network and facilitating technology transfer among member economies in the field of materials evaluation technology
- Bridging the technological gap between R&D organizations, innovative enterprises and the market places
- Stimulating the diffusion of new materials evaluation and processing technologies into the related sectors of industries

8. Conclusion

International cooperation is necessary and urgent when we consider the time required to deal with the problems to reduce the technical barrier to trade. The areas for cooperation will possibly be:

- production of reference materials and their certifications;
- development of improved norms for more reliable test results;
- development of protocol for proficiency test;
- evaluation of uncertainty parameters in materials test; and
- securing the equivalence in materials testing through key comparisons

In addition to this, regional cooperation becomes very important issue in view of the free trade agreement for the common prosperity in regional area as well as for the international standard development.

For the case of materials properties testing and evaluation, the international cooperation for the establishment of standard is rather slow compare to its big portion among the international trade. As the speed of development of new materials and related product quickly increasing and they appear in the market very fast without having enough evaluation and verification for safety, this can be a trade barrier in the near future, especially when the environmental issue is concerned. To overcome this problem, especially for the materials related one, international cooperation for the development of CRMs to provide the standard for materials metrology is urgently required. CRM cannot be a CRM without international acceptance and approve. As is well known, LGC, BAM, IRMM and NIST are cooperating together for the development CRMs to save money and time. It is very timely to discuss on a program for the cooperation of development of CRMs in Asia Pacific region.

Certified Reference Materials-the European Perspective

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Certified Reference Materials - the European Perspective

Dr. Doris Florian

Institute for Reference Materials and Measurements (IRMM)
Geel, Belgium

http://www.irmm.jrc.be
http://www.jrc.cec.eu.int

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Today's topics

- **IRMM and its role in Europe**
- **Certified Reference Materials (CRMs)**
  - **Why do we need them?**
  - **What are they used for?**
  - **Example: Belgian dioxin crises**
  - **Examples of other CRM networks**
- **The European Reference Materials (ERM®) Initiative**
- **Conclusions**

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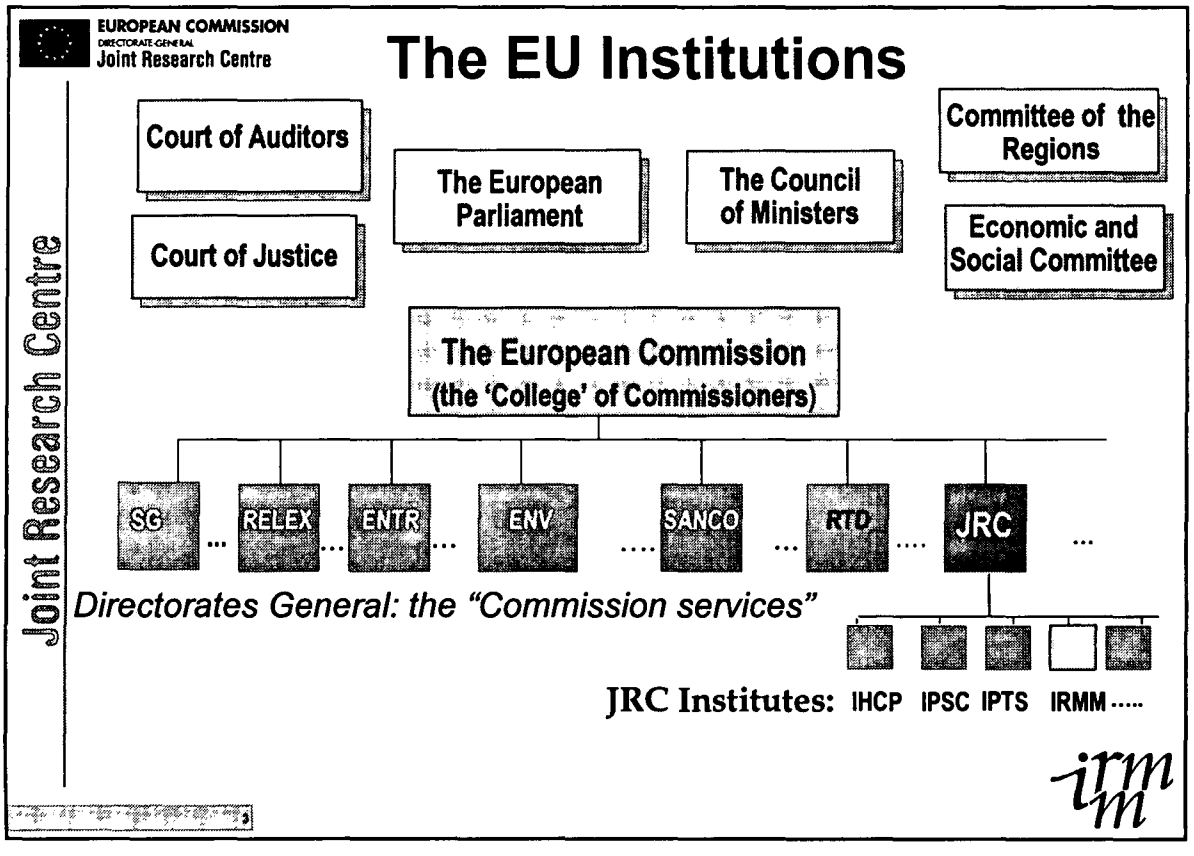
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DIRECTORATE-GENERAL
Joint Research Centre
The EU Institutions
Court of Auditors
Court of Justice
The European Parliament
The Council of Ministers
Committee of the Regions
Economic and Social Committee
The European Commission
(the 'College' of Commissioners)
SG
RELEX
ENTR
ENV
SANCO
RTD
JRC
Directorates General: the "Commission services"
JRC Institutes: IHCP IPSC IPTS IRMM
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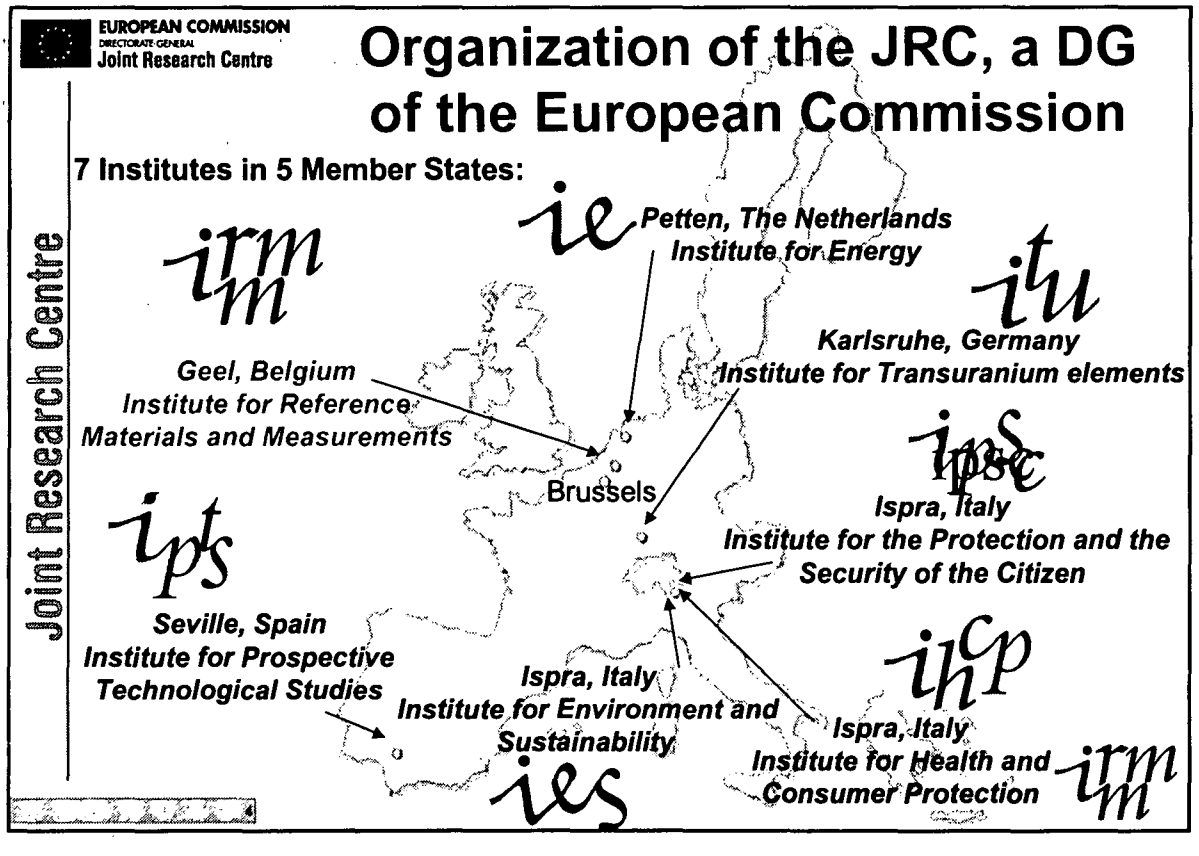
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Organization of the JRC, a DG of the European Commission
7 Institutes in 5 Member States:
Petten, The Netherlands
Institute for Energy
Karlsruhe, Germany
Institute for Transuranium elements
Geel, Belgium
Institute for Reference Materials and Measurements
Brussels
Ispra, Italy
Institute for the Protection and the Security of the Citizen
Seville, Spain
Institute for Prospective Technological Studies
Ispra, Italy
Institute for Environment and Sustainability
Ispra, Italy
Institute for Health and Consumer Protection
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JRC and IRMM Figures

- Largest Directorate General of the European Commission
- JRC: > 2250 staff, IRMM: 250 staff
- JRC: > 100 staff from incoming Member States, IRMM: 10-15 staff
- JRC: > 260 M EURO, IRMM: 32 M EURO per year budget

irmm

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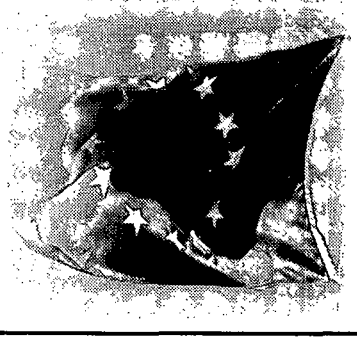
Mission of the JRC

... to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies ...

...the JRC functions as a centre of science and technology reference for the EU, independent of private and national interests...



irmm

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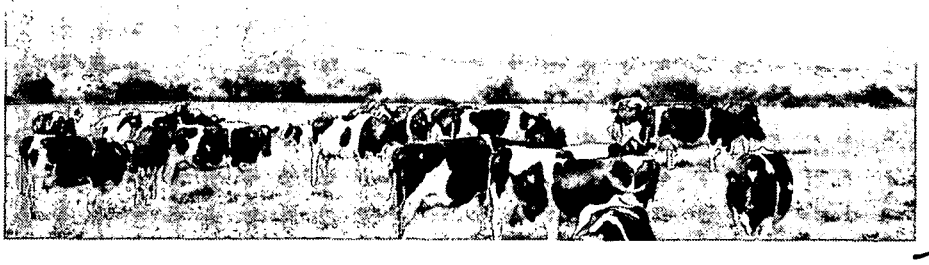
Rationale

Joint Research Centre

- 20% of all EU legislation has a significant S&T basis (e.g. food, chemicals, environment, energy)
  - Advanced analytical requirements, e.g. GMOs, BSE...
  - Networking, harmonisation, best practice, validation, training, reference
- 1/3 of EU legislation relies on measurements
  - Main users are Commission Policy DGs and Member States competent authorities



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IRMM's mission

Joint Research Centre

The mission of the IRMM is to promote a common European measurement system in support of EU policies, especially health and consumer protection, environment, agriculture, internal market and industrial standards.

IRMM prime objectives are to perform specific reference measurements, to produce certified reference materials, to organise international measurement evaluation programmes, to contribute reference data to trans-national databases and to carry out pre-normative research and develop advanced testing methods.

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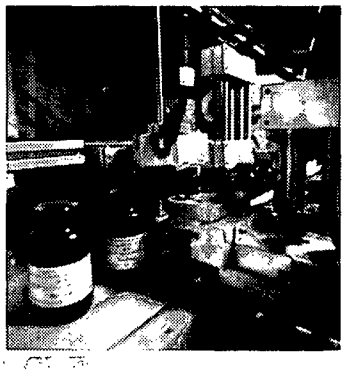
IRMM core competences 2003 - 2006

- Food safety and quality
- Bio-analysis
- Reference materials
- Metrology in chemistry
- Nuclear safeguards
- Radionuclide metrology
- Neutron data measurements



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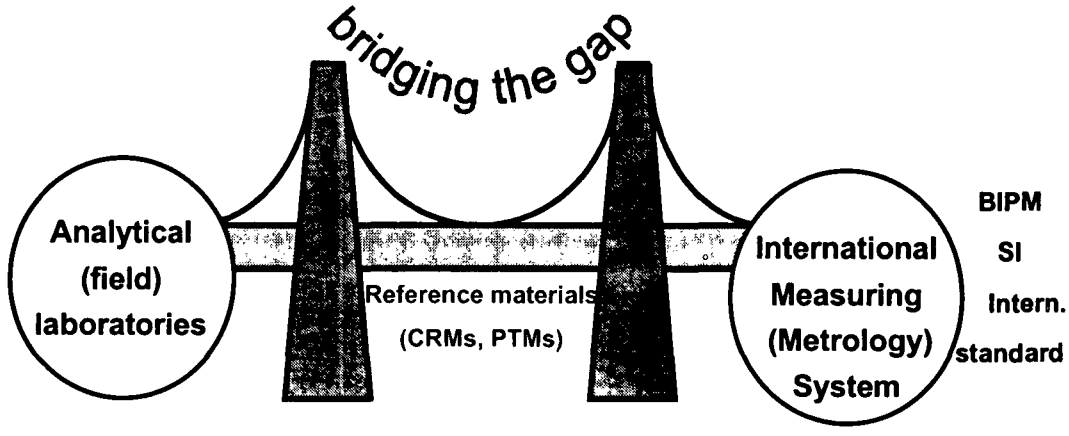
Quality and traceability of analytical results



Application of "standard" methods

Precision, local comparability

Proper use of Reference Materials

Trueness, global comparability

Key comparisons

Intergovernmental Mutual Recognition Arrangement

"once measured, accepted everywhere"

Traceability

irmm

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Metrology in chemistry (MiC)

Joint Research Centre

- IRMM represents European Commission in international measurement infrastructure (e.g. BIPM, EUROMET, EURACHEM, CITAC, EA)
- Conceptual input and experimental input (e.g. as pilot laboratory) in international fora
- Target: development of chemical reference methods
- International measurement evaluation programme (IMEP)

Mutual recognition
of national measurement standards
and of calibration and measurement certificates
issued by national metrology institutes

Paris, 14 October 1999

Comité international des poids et mesures

Bureau international des poids et mesures

Organisation intergouvernementale de la Convention du Mètre

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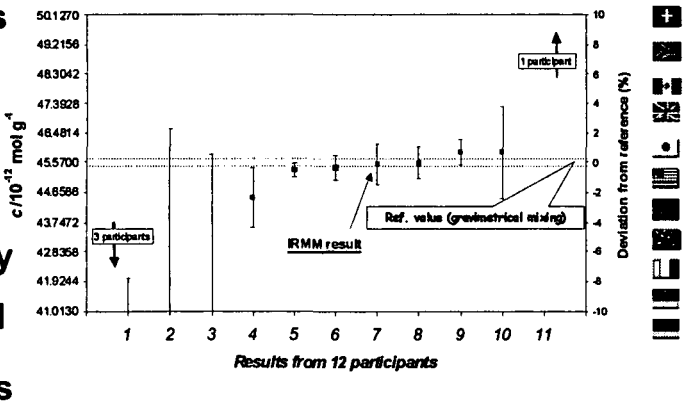
IRMM's role inside the international measurement infrastructure

Joint Research Centre

- IRMM is signatory of the CIPM-MRA
- IRMM's measurement capability and its CRMs are recognised internationally
- IRMM participates to international benchmarking of measurement capability
- IRMM assists BIPM and EUROMET in such benchmarking activities

IRMM contribution to CCQM-P13 contaminants in food digest



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An International CRM Network

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An International CRM Network

Hun-Young So, Ph. D.
Korea Research Institute of Standards and Science

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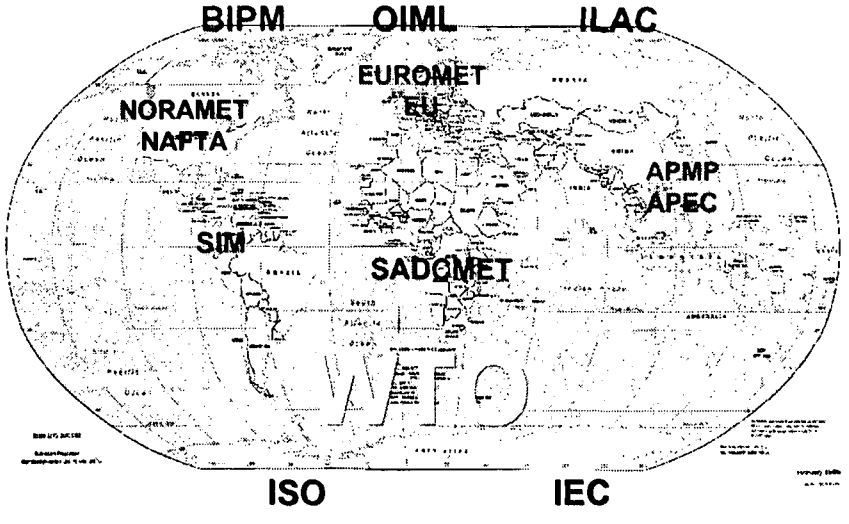
International Scene



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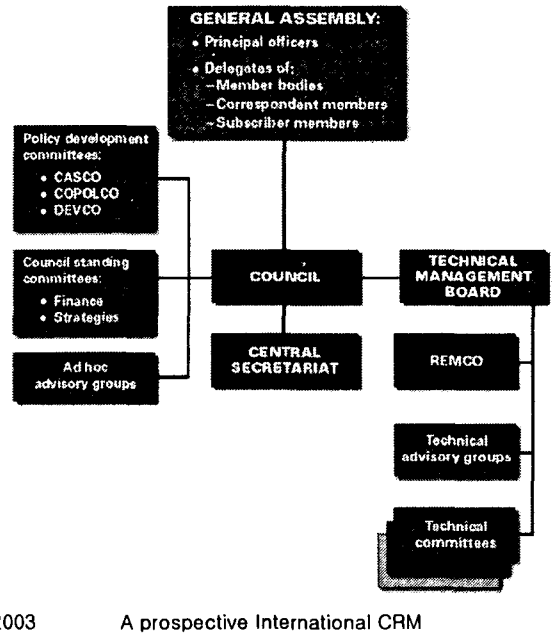
ISO structure



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ISO REMCO

Terms of reference

- To establish definitions, categories, levels and classification of reference materials for use by ISO.
- To determine the structure of related forms of reference materials.
- To formulate criteria to be applied for choice of sources for mention in ISO documents (covering also legal aspects).
- To prepare guidelines for technical committees for making reference to reference materials in ISO documents.
- To propose, as far as necessary, action to be taken on reference materials required for ISO work.
- To deal with matters within its competence arising in relation with other international organizations and to advise the Technical Management Board on action to be taken.

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ISO REMCO

Committee on reference materials

Standards and/or guides of REMCO

ISO Guide **30**:1992 Terms and definitions used in connection with reference materials

ISO Guide **31**:2000 Reference materials -- Contents of certificates and labels

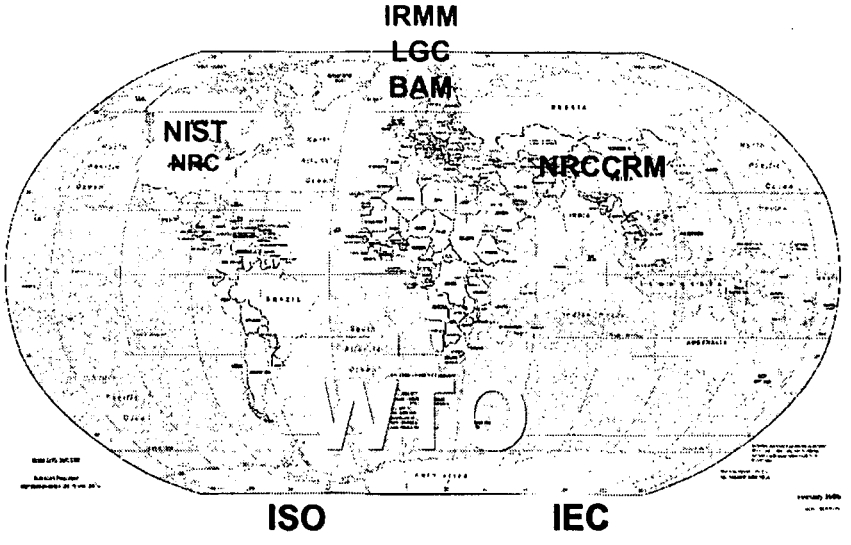
ISO Guide **32**:1997 Calibration in analytical chemistry and use of certified reference materials

ISO Guide **33**:2000 Uses of certified reference materials

ISO Guide **34**:2000 General requirements for the competence of reference material producers

ISO Guide **35**:1989 Certification of reference materials -- General and statistical principles

Big CMR producers, NMs



Summary of NIST SRMs

In the area of

- Health and clinical, Industrial hygiene, Environmental, Food and agriculture, High purity materials, Industrial materials, Engineering materials, Physical properties, Radioactivities (9 categories)
- Approx. 1,400 SRMs
- 35,000 units/yr
- 10,000 customers
- 1/3 of delivered abroad
- 100 years old activity

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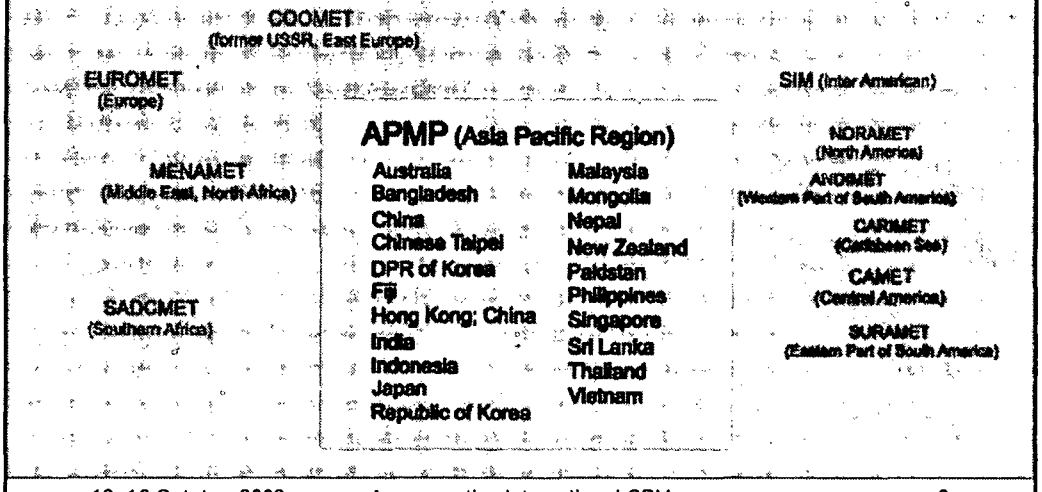
APMP

Regional Organizations for Measurement Standards in the World



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TCQM, APMP

- TCQM is one of 11 technical committees
- 4 working groups
  - **Inorganic analysis - Li Yunqiao NRCCRM**
  - **Organic analysis - Lindsey Mackay NARL**
  - **Gas analysis - Jin Seog Kim KRISS**
  - **Electrochemical analysis - Susumu Nakamura NMIJ**
- Meet once a year in conjunction with the APMP General Assembly
  - **2-day meeting with ca 25-30 attendees from 15 countries**
  - **5th meeting Singapore Dec 2003**

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Regional Scene

Only four NMIs of member economies are producing CRMs

- Australia, NARL
- China, NRCCRM
- Japan, NMIJ & CERI
- Republic of Korea, KRISS

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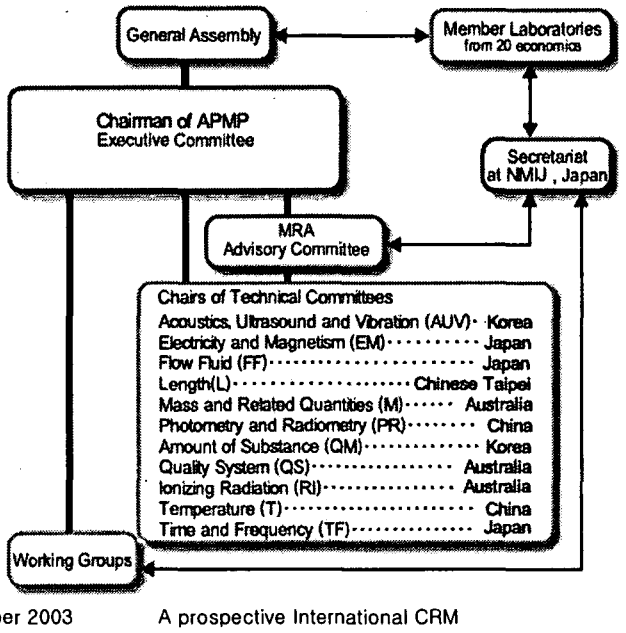
Organization Chart, APMP



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TCQM, APMP

22 TCQM Member Countries

Australia
Bangladesh
China
Chinese Tapei
Egypt
Fiji
Hong Kong
India
Indonesia
Japan
Korea
Malaysia
Philippines
Singapore
South Africa
Sri Lanka
Thailand
Vietnam

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Signatories of CIPM MRA

- 10 Signatories
  - Australia, China, Chinese Taipei, Hong Kong China, India, Japan, Korea, Malaysia, New Zealand, Singapore, Thailand
- 11 Non-signatories
  - Bangladesh, Fiji, Indonesia, DPR Korea, Mongolia, Nepal, Pakistan, Philippians, Sri Lanka, Vietnam

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Establishment of an International CRM Center *i*-CRMC

A BIG Dream?

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Missions of the *i*-CRMC

- to produce CRMs by cooperation between Korea, Japan and China and distribute to the Region
- to conduct joint research projects for the development of CRMs in cooperation with the Asia-Pacific Metrology Program (APMP)
- to develop proficiency test schemes in cooperation with the Asia-Pacific Laboratory Accreditation Cooperation (APLAC)
- to organize educational programs for the developing economies in the Region

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Objectives of *i*-CRMC

- to respond to the demand of CRMs specifically needed in the Region
- to act as a focal point to promote the proper use of CRMs and to facilitate the availability of CRMs

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Expected Partners

- KRISS, Korea
- NMIJ, Japan
- NRCCRM, China
- *NARL, Australia*

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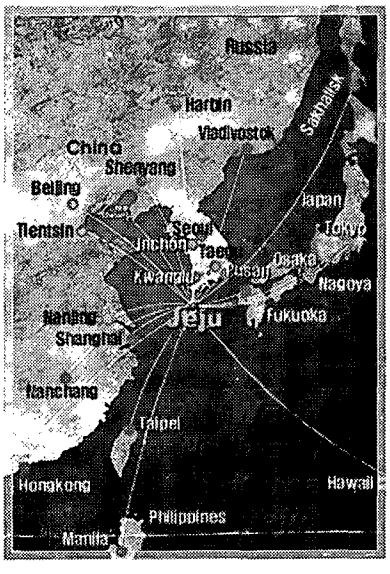
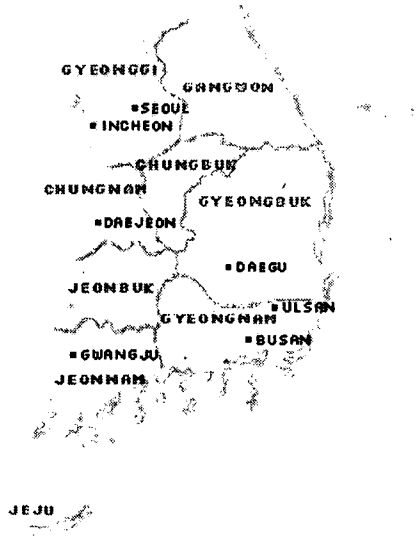
Where is Jeju?





The Present Status and Progress of Metallurgical CRMs in China

Seminar for the Development of a Prospective International CRM Network
Oct. 13~16, 2003, KRISS, Daejeon, Korea

THE PRESENT STATUS AND PROGRESS OF METALLURGICAL CRMs IN CHINA

Chongxian Ma
(Shanghai Research Institute of Materials, SRIM, Shanghai 200437,China)

ABSTRACT: The current status of metallurgical CRM-production organizations in China are briefly introduced. Activities associated with the research & development of CRMs in some major units are especially described. Some operational methods for regional or international cooperation of metallurgical CRMs are suggested.

1. Metallurgical CRM Production System in China

In 1952 , the first certified reference materials (CRMs) e.g. pig iron , low carbon steel and spring steel etc. were prepared by Shanghai Research Institute of Materials (SRIM). Since then on , China began to the preparation , production and sale of reference materials (RMs) .

There are at present two sets of CRM administration systems in China. In different fields people use different names. Standardization workers in China usually call CRMs in Chinese "Guo Jia Shi Wu Biao Zhun (GSB) ,which means state substance standards, or standard samples"; but metrology workers call them "Guo Jia Biao Zhun Wu Zhi (GBW), which means state standard substance, ". The Standardization Administration of China (SAC) is responsible for administering the activities of R & D of GSB at state grade. But GBW is managed by Chinese Society for Measurement (CSM), though both GSB and GBW should finally be approved by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China (GASSIQ). Both are fundamentally also alike in preparation and appraisal program. Since Prof. Yadong Yu, Director of National Research Center for CRMs, has already made a detailed introduction about CRMs (GBW), I here will mainly focus on GSB, or standard samples.

Since 1970`s, with the development of national economy and the application of new technology, the varieties and application of CRMs have increased greatly. Up to now 16 categories about thousands of GSB associated with geology & mineral products , physical & physicochemical characteristic, steel & iron, nonferrous metals, chemical products, coal & petroleum, environmental chemistry, building materials, clinical chemistry, medicines, engineering & technology characteristic, physics & metrological characteristic and others have been developed.

In this paper, the metallurgical CRMs mainly involve in ferrous CRMs and nonferrous CRMs. In China, standard samples fall into further two categories: state grade standard samples which are labeled beginning with GSB and ministry grade standard samples which are labeled beginning with YSB for ferrous samples or with YYS for nonferrous samples. The state grade standard samples (GSB) are appraised by the National Technical Committee of CRMs, while the ministry grade standard samples are appraised by the Metallurgical Subcommittee and Nonferrous Metals Subcommittee in the National Technical Committee of CRMs respectively. Both the state grade and the ministry grade ones have issued related standards or technical specifications for the R & D of CRMs. The amount of Metallurgical CRMs is list in Table 1 and Table 2.

Table 1. Classification of ferrous metal CRMs (until Dec.2001)

item	Non-alloy steel	Low alloy steel	Alloy steel	Tool steel	HT alloy	Iron alloy	Ore	Fire-brick	others	Pure Iron etc.	Total
GSB	50	12	112	25	22	15	20		39		295
YSB	384	96	390	28	64	69	175	43	180	536	1697
GBW	16	34	81	6	9	13	24	13		36	229
SUM	450	142	583	59	73	104	214	76	180	611	2221

Table 2. Classification of nonferrous metal CRMs (until Aug.2003)

item	Cu alloy	Al alloy	Zn alloy	Sn/Pb alloy	Mg/Ti alloy	Precious metal	Rare earth	Gas in metal	Others	Total
GSB	20	43	5	18	2	13	3	16	3	123
YYS	112	89	9	11	5	1			13	240
GBW	28	13	5	5	4	3	3	15	7	83
SUM	160	145	19	34	11	17	6	31	23	446

2.Some Major Producers Related to Metallurgical CRM in China

There are 45 accredited producer engaged in preparation of metallurgical CRMs in China. Among them 26 are for ferrous metals and 19 for nonferrous metals. They are set up in research institutes and some large scale companies. Most of them belong to metallurgical industry and nonferrous metal industry, the others belong to machinery, aviation, weaponry industry and scientific & technological system. Some major producers related to metallurgical CRMs are briefly introduced as follows.

1) Shanghai Research Institute of Materials(SRIM), Shanghai

SRIM, with splendid career since its foundation in 1946, is a polytechnic

research organization with a large scale and an advanced level for materials engineering and application. It is one of the certified producer which have been accredited for preparation of both ferrous and nonferrous CRMs. R & D Division of CRMs in SRIM is responsible for preparation, development and marketing of CRMs. It can supply at present about 200 kinds of CRMs, among them 18 are Primary RM (GBW), 12 are Secondary RM [GBW(E)] and 15 are state grade standard sample(GSB), including various sorts of bronze, bearing alloys, pure copper, aluminum alloys, oxygen in copper , stainless steels and iron oxide powder etc. Others are ministry grade standard samples (YSB). Some of them were exported to many foreign countries and areas.

2) Central Iron & Steel Research Institute (CISRI), Beijing

CISRI, founded in 1952, is the country`s largest and most comprehensive research organization specialized in iron and steel metallurgy. It has about 400 kinds of diverse RMs. Varieties of RMs include cast irons, carbon steels, alloy structure steels, stainless steels and high-temperature alloys etc. Among them, CRMs of alloy structure steels, high-temperature alloys, standard solutions and spectral correcting samples are its distinctive feature.

3) *Shandong Metallurgical Research Institute(SMRI), Jinan ,* Shandong Province

SMRI, which began to develop and prepare RMs in 1966 under the help of SRIM, has now become the most productive supplier in China. It has more than 700 kinds of RMs. Pig irons, cast irons, coals *and aluminum alloys are most representative ones.*

4) *Anshan Iron & Steel Company Ltd., Anshan, L*iaoning Province

This enterprise is one of the biggest iron & steel companies in China. The ones of carbon steels, low alloy steels and iron ores are the best heeded in marketplace among more than 200kinds of *RMs*

a) Shanghai institute of Iron & Steel , Shanghai

This institute is quite distinguished in developing and preparing CRMs for stainless steels, precision alloys and the gases (such as O, N, H, C, S etc.) in steels.

a) Jilin Iron Alloy Company Ltd. , Jilin, Jilin Province

Jilin Iron Alloy Company Ltd. is the biggest enterprise in China specialized in producing various kinds of iron alloys, e.g. manganese iron, chromium iron .The CRMs of various iron alloys developed can meet the demands of different users.

a) *Southwest Aluminum Industry (Group) Co. Ltd.*, Chongqing

This company has been developing very fast in recent years in preparing spectral CRMs. A large amount of various kinds of CRMs, such as pure aluminum, aluminum alloy, magnesium alloy, Al-Li alloy, have been prepared. All these are especially widely acknowledged for its high *smoothness and large diameter(* 60mm).

a) *Luoyang Copper (Group) Co. Ltd., Luoyang, H*enan Province

As the biggest enterprise of copper processing in China, this company once produced coins for Euro. The CRMs prepared mainly include pure copper, brass, bronze and aluminum bronze. Both spectral CRMs and chemical CRMs are obtainable.

3. New research focal points in development of metallurgical CRMs

In recent years, more attention has been given to the development and preparation of metallurgical CRMs in China as follow.

1) R & D of spectral CRMs

With the wide application of photoelectric emission spectroscopic analysis in labs of enterprises and testing organizations, the demand for spectral CRMs, *especially correcting samples, are on the rise.*

*2) Certification and evaluation of the uncertainty in spectral CRM*s

Generally for developing a new CRM, the cooperative analysis for certification should be performed by 8 labs and several accurate and reliable analysis methods, which may be based on different principles, should be used as far as possible. But as for spectral correcting samples, certification performed by 3~4 labs might be permitted.

Until now with the development of spectral CRMs, the evaluation of the uncertainty in spectral CRMs has become the focus of discussion. A relatively consistent opinion is that 3 factors need to be considered: ① the uncertainty occurred in cooperative analysis for certification; ② the uncertainty brought about by the inhomogeneity between pieces of samples; ③ the uncertainty brought about by the inhomogeneity inside samples itself.

3) Traceability

With the wide application of modern instrumental methods in certification of CRMs, such as determination of C, S, O, N, H etc., the traceability of certification of CRMs attract more and more attention.

1) R & D of the series of CRMs

In order to meet the need of drawing calibration curves when using the methods, such as spectrometry, AAS, AFS, ICP-AES and ICP-MS, a series of CRMs are welcome. For example, CISRI is preparing a series of low & middle alloy steel *CRMs which consist of 27 kinds of element.*

1) R & D of ultralow carbon or/and sulfur ferrous CRMs

At present , the content of carbon or/and sulfur for some iron and steel products is very low, such as 0.000X%, this has brought new challenge to the preparation and certification of CRMs.

2) *R & D of CRMs* for new materials

More and more emphasis is also being paid to the R & D of CRMs for new materials, for example, Al-Li alloy , oxides of rare earth elements, magnesium alloy, titanium alloy and some alloys based on international standards. e.g. A356, ADC12, AC7A, A380, 6063, 304, 316, 316L,17-4 PH.

4. Some suggestions to regional or international cooperation in R & D of CRMs

1) Cooperative certification of CRMs

Beside using several methods, for developing a new CRM, the certification should be performed by 8 labs. It is requested to use the primary reference materials provided by an anthorized organization such as NRCCRM and instruments calibrated at the highest level for keeping traceability for certification of CRMs. Through international cooperation, the reliability of certification of CRMs *might be improved.*

2) Hold seminars about R & D of CRMs regularly. Commmon problem concerning CRMs would be discussed extensively.

3) Provide catalogues of CRMs to each other and strengthen communication between countries so as to promote the application of CRMs.

4) Carry out international key comparisons of CRMs and inspect the accurateness of certification.

Acknowledgement

The author is very appreciative to Prof. Wu Yang for useful discussion and earnest direction during preparation of the present paper.

Development of Certified Reference Materials at NMIJ, Japan

DEVELOPMENT OF CERTIFIED REFERENCE MATERIALS AT NMIJ, JAPAN

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National Metrology Institute of Japan (NMIJ) is currently responsible for the production of SI traceable certified reference materials in Japan. The chemical metrology group of NMIJ consists of three divisions: the inorganic analysis division, the organic analysis division and the materials characterization division. At present, 35 staff members are working on chemical metrology, together with 42 post-doctoral scientists, visiting researchers and technicians. We are studying on the development of highly precise and sensitive analytical methods, which provide good traceability to SI. We are also engaged in the production of certified reference materials according to ISO Guide 34 and 35. Our technical competence for production was audited by the CCQM peer reviewers last October, and NMIJ is now accredited as a certified reference producing organization by NITE.

NMIJ is currently providing reference materials through two different schemes, that is, JCSS (Japan Calibration Service System) and NMIJ CRM system (Certified Reference Material System). The JCSS is based on the Japanese Measurement Law, in which basic standards such as standard gases, metallic standard solutions, organic standard solutions, pH standards necessary for calibration purposes. On the other hand, the NMIJ CRMs prepared and certified according to ISO Guide 34 and 35 are being used in chemical laboratories for validation of analytical methods, analytical quality assurance, etc. NMIJ has so far provided a total of 140 reference materials. Gas standards (30 items), inorganic standard solutions (35), pH standard solutions (6), and organic standard solutions (33) are being provided through the JCSS. On the other hand, pure organic and inorganic CRMs (9), environmental natural-matrix CRMs (3), polymer CRMs (9), advanced materials CRMs (17), and other gas standards (3) have been produced as NMIJ-CRMs and distributed worldwide.

NMIJ is now planning to develop and supply a total number of 250 standards until 2010. First of all, NMIJ is going to increase the number of basic standards available to meet a maximum requisite level. Secondly, NMIJ gives a high priority to the standards essential for safety and quality of life, for example, sediments, natural water and air-born particles CRMs for environmental protection, and also to the standards required

by high-technology industries such as multi-layer standards, ion-implanted Si wafer standards and nano-pore standards. Furthermore, NMIJ is going to extend our CRM products to cover those in new and challenging fields such as bioanalysis, clinical chemistry, food analysis, and nano-technology in the next 5 years.

CRM Production in Korea

CRM Production in Korea

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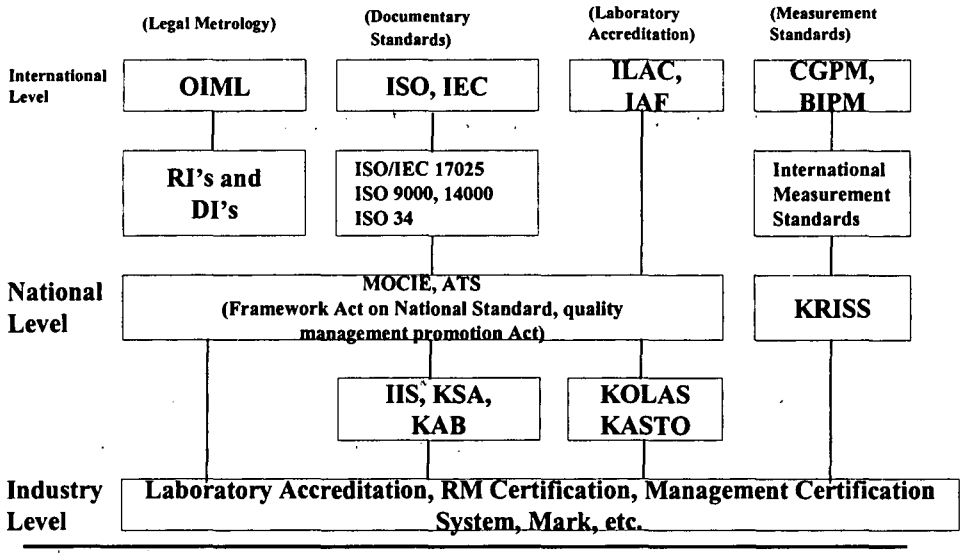
Chemical Metrology & Materials Evaluation
Korea Research Institute of Standards and Science

Definition of RM and CRM

- Reference Material (RM) VIM(1993) 6.13
  - Material or substance one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
- Certified Reference Material (CRM) VIM(1993) 6.14
  - Reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence.

CRM in Korea

Accreditation/Certification System in Korea



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CRM in Korea

OML	:	Organization International de Métrology Légale
ISO	:	International Organization for Standardization
IEC	:	International Electrotechnical Commission
IAF	:	International Accreditation Forum
ILAC	:	International Laboratory Accreditation Conference
CGPM	:	Conférence Générale des Poids et Mesures
BIPM	:	Bureau International des Poids et Mesures
MOICE	:	Ministry of Commerce, Industry and Energy
ATS	:	Korean Agency for Technology and Standards
KRISS	:	Korea Research Institute of Standards and Science
IIS	:	The Institute of Industry Standards and Science
KSA	:	Korea Standards Association
KAB	:	Korea Accreditation Board
KASTO	:	Korea Associations of Standards and Testing Organizations
KOLAS	:	Korea Laboratory Accreditation Scheme

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CRM in Korea

National Metrology Institutes

- **Highest authority in metrology**
- **Maintain the national measurement standards**
  - Directly traceable to primary standards when NMI realize the SI units of measurement standards
  - Should insure that the measurements are traceable to a primary standards when NMI does not realize the SI units.
- **Responsible for disseminating the national measurement standard**
- **KRISS is the NMI of Korea**

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CRM in Korea

APMP Criteria for Accepting a Quality System

- Basic Criteria
  - The implementation of a quality system satisfying ISO/IEC 17025 (or for reference material producers , ISO Guide 34 or ILAC Guide 12), and
  - Technical competence to provide a calibration and measurement service that can deliver the uncertainties claimed.
- Compliance
  - Third party accreditation (ex. NML, NMIJ)
  - Certification to ISO 9001 and attestation by technical peers (ex. KRISS)
    (Certification to ISO 9001 must be from a certification provider operating to ISO Guide 62 and is accredited by a member of the IAF)
  - Attestation by a team consisting of quality system experts and technical peers, organized through APLAC or a recognized accreditation body (ex. NIM, NIMT)

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Key Comparison (KRISS participation)

CC	CIPM KC		BIPM KC		APMP KC
	KC	SC	KC	SC	KC
AUV	8 (5)	-	-	-	1 (1)
QM	40 (21)	-	-	-	2 (2)
EM	44 (19)	2 (1)	9 (1)	-	-
RI	41 (14)	2 (0)	61(6)	2 (0)	5 (4)
L	7 (5)	1 (1)	1 (1)	-	2 (2)
M	63 (25)	6 (6)	-	-	12 (7)
PR	13 (6)	3 (1)	-	-	1 (1)
T	7 (5)	-	-	-	-
TOTAL	223 (100)	14 (9)	71 (8)	2 (0)	23 (17)

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KRISS Quality System on CRM

- Following International Recommendations
  - ISO Guide 31, 34, 35
  - Traceabilty based on primary method
  - Reliability and comparability by KC participations
  - Peer reviewed by international audits
- Audited by Internal technical committee on batch-typed CRM production and certification

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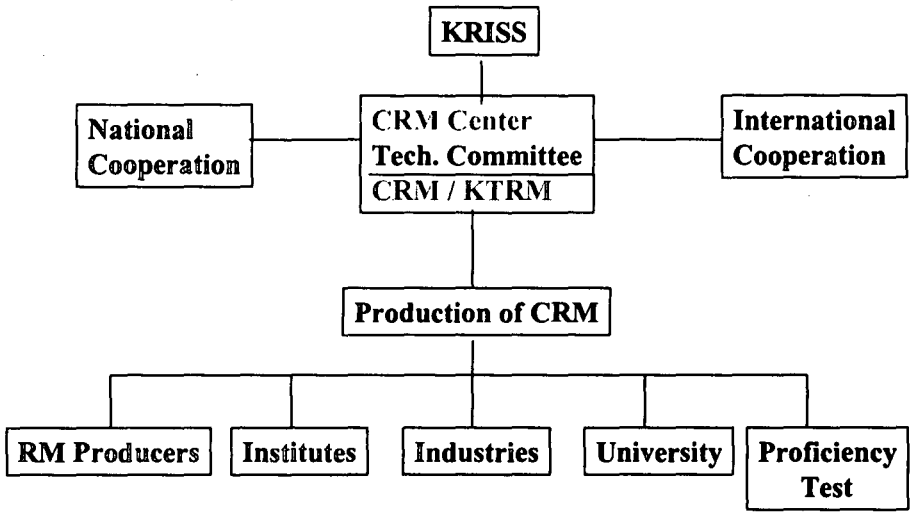
National System on CRM production



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CRM Production : ISO Guide 31, 34, 35

1. Examination of custom demand & Planning of development
2. Preparation
3. Evaluation of homogeneity
4. Evaluation of stability
5. Define characterizing order
6. Maintain traceability to national standard
7. Determine characteristic values
8. Storage
9. Packing, Custom Service

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CRM in Korea

CRM produced from KRISS (2002 Catalogue)

Chemical Composition : 273 items

Physical Property : 93 items

Engineering Property : 15 items

~ 25 new CRMs are developed in a year

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CRM in Korea

Gas CRM on Green House Gas Analysis

Objective : For Green house gas analysis on emission and ambient level

CO_2, CH_4, N_2O, CF_4, C_2F_6, C_3F_8, SF_6, NF_3

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CRM in Korea

Vegetable CRM for residual pesticide analysis

Diazinon, Chloropyrifos-Me, Parathion-Me, Fenitrothion
Malathion,Endosulfan-I & II

Objective: carrot and cabbage CRMs for pesticide analysis

Organic phosphorus pesticides & chlorinated pesticides

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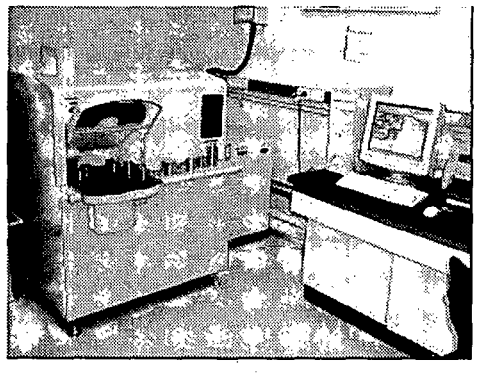
CRM in Korea

Low Alloy Steel CRM

Objective: for the chemical analysis of Low Alloy Steel (6 items for 15 chemical elements)

Manufactured by **RIST and certified by KRISS**



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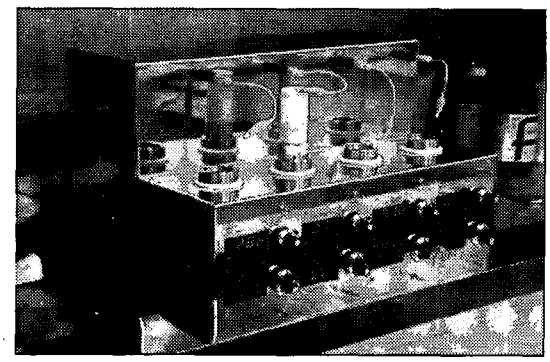
CRM in Korea

Radioactivity CRMs for Medical Treatment

Objective: alpha and beta emitting nuclides for calibration of medical treatment

Sr-90, I-131, Cr-51, Na-22, Am-241, Cl-36, Ni-65



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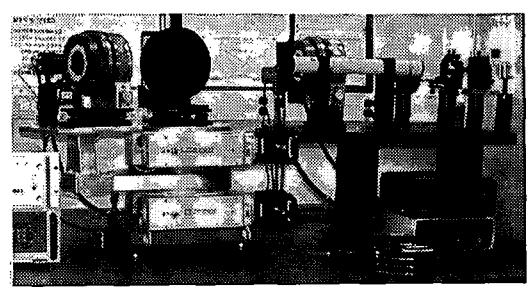
CRM in Korea

Thin film thickness CRM for semiconductor process

Objective: 1.4 - 2.9 nm gate oxide thickness analysis for next generation semiconductor

Manufactured by Samsung Electronics
Certified by KRISS



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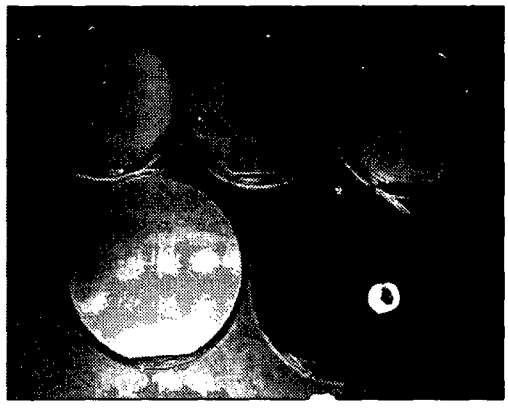
CRM in Korea

Sheet Resistance CRM

Objective:
For semiconductor process control

6 items:
From 100 mΩ/sq to 1,000Ω/sq



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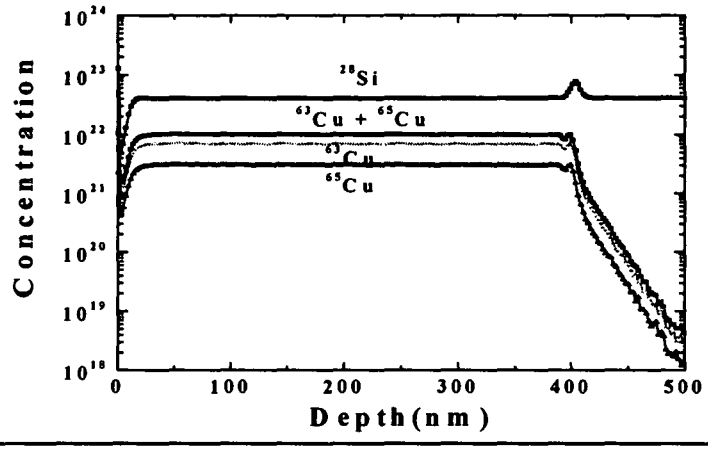
CRM in Korea

Impurity doped Si Thin Film CRM

Objective: Quantitative analysis of minor impurities on Si thin film by SIMS



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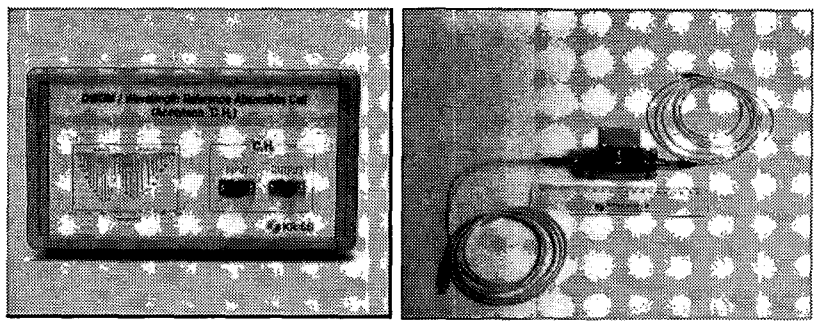
CRM in Korea

Wave length standard on Optical communication

Objective: 1500 nm region wavelength standard to support a dense wavelength division multiplexed (DWDM) optical fiber communication systems



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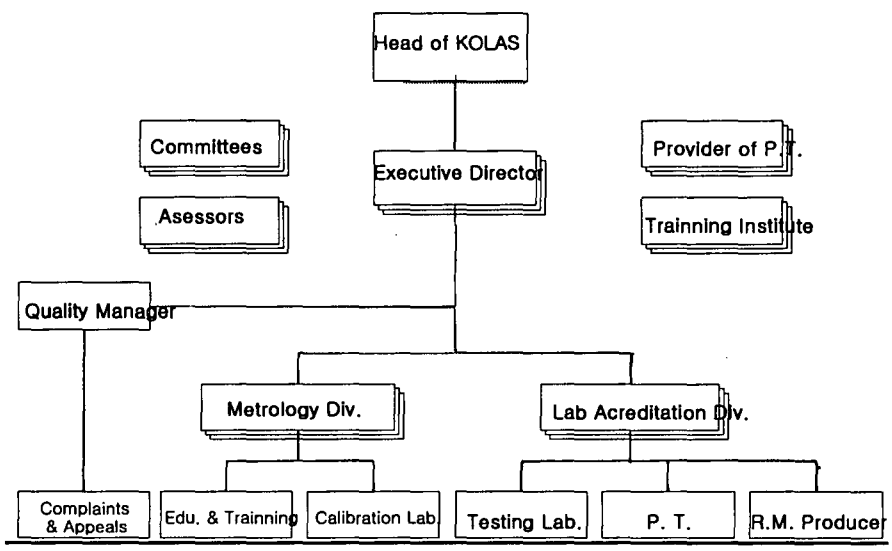
CRM in Korea

KOLAS Organization



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CRM in Korea

History of KOLAS

- Dec. 1992: Launched KOLAS
- Apr. 1995: Joined the APLAC as a full member
- Sep. 1996: Joined the ILAC as a inaugural member
- Sep. 1998: Integrated the accreditation program of calibration laboratories into KOLAS
- Oct. 1998: Signed the APLAC MRA for testing field
- Jun. 2000: Re-assessment of accredited calibration laboratories
- May 2001: Extended the APLAC MRA to include calibration laboratories

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CRM in Korea

Basic Policy on Traceability

- All Accredited Labs should use SI units
- Accredited Testing/RM Labs shall in all cases derive their traceability directly from KRISS
- If traceability cannot be established within the country, all Labs shall demonstrate the source of traceability, issued from Lab accredited by KOLAS's MRA Partner

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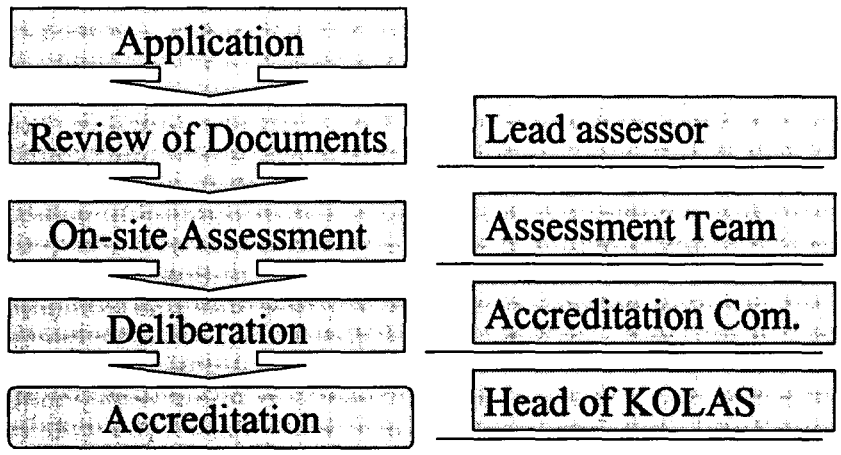
Accreditation Procedure



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RM Certification Field

- **Chemical Composition RMs**
  Ferrous metals, nonferrous metals, microanalysis, high purity materials, high purity chemicals, inorganics rocks and ores, food and agricultures, environment pollutants, health & industry hygiene, biochemical materials, gaseous materials, ion activity, polymer materials

- **Physical Properties RMs**
  Thermodynamic properties, optical properties, radioactivity, electricity and magnetic properties, length, density and viscosity, material properties

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CRM in Korea

RM Producers States

- **RM Producers in Korea**
  - 10 specialty gas companies
  - 1 steel institute
  - 1 geology institute
  - 1 chemical solution lab.

- **Lab Accreditation for RM Producer**
  - Accreditation body : KOLAS
  - Accredited RM Producer : None
    (6 RM producers are preparing KOLAS application according to ISO Guide 34)

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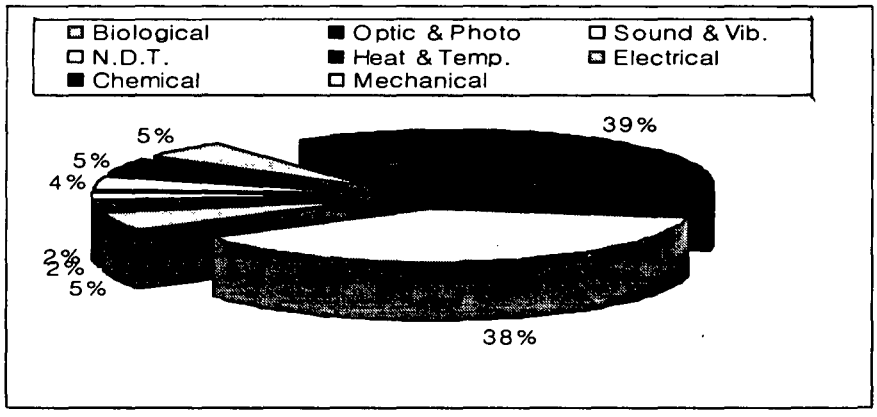
CRM in Korea

Status of Accredited Testing Lab.

Accredited laboratories :174 (2003.6.30)



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Proficiency Testing

- Any laboratory that desires to participate
- KOLAS accredited laboratories required to participate at least once every 3 years
- Applicants recommended to show the proficiency testing reports

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PARTICIPANT LIST

SEMINAR FOR THE DEVELOPMENT OF A PROSPECTIVE INTERNATIONAL CRM NETWORK
IN CONJUNCTION WITH
APMP TCQM GAS WORKING GROUP WORKSHOP
OCTOBER 13 ~ 16, 2003
KOREA RESEARCH INSTITUTE OF STANDARDS AND SCIENCE (KRISS), DAEJEON, REP. OF KOREA

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<UNIDO Project TF/GLO/95/005>

FINAL REPORT

"SEMINAR FOR THE DEVELOPMENT OF A PROSPECTIVE INTERNATIONAL CRM NETWORK"

in conjunction with

"APMP TCQM GAS WORKING GROUP WORKSHOP"

October 13 ~ 16, 2003

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1. Introduction

Certified Reference Materials (CRMs) are artifacts being analyzed by national metrology institutes (NMIs) to be used as reliable reference in measurement of material properties and chemical compositions. CRMs are used in most of the laboratories seeking to demonstrate that they comply with internationally recognized requirements of quality system and have competence in the services they provide. So CRMs are required to guarantee their quality as standards to provide transparent and traceable path of the services by the laboratories to the International System (SI) of units.

CRMs are produced for the development of accurate methods of analyses, calibration of measurement equipment, quality control, determination of material performance characteristics, and also for the assurance of the long-term stability and integrity of quality assurance programs. Particularly, they are used as primary reference measurement standards in such areas as clinical testing, air and water pollution monitoring, low-level radioactive pollution monitoring, and production control of basic materials, including steel, rubber, cement, and plastics.

With an increasing demand of laboratory accreditation as a process of conformity assessment based on internationally recognized standards such as ISO/IEC 17025, ISO/IEC 9000 series, etc, the use of CRM has become an absolute necessity as an evidence of fulfilling one of the technical requirements; measurement traceability.

Furthermore, there have been many efforts in international communities to reduce the technical barriers to trade with the advent of WTO/TBT Agreement. The Agreement on Technical Barriers to Trade (TBT) tries to ensure that regulations, standards, testing and certification procedures do not create unnecessary obstacles. It is based on the concept that *"Technical regulations and industrial standards are important, but they vary from country to country. Having too many different standards makes life difficult*

for producers and exporters. If the standards are set arbitrarily, they could be used as an excuse for protectionism and standards can become obstacles to trade". By considering the importance of measurement, calibration and test certificates issued by laboratories in an exporting country, national accreditation and regulatory bodies have made mutual agreements and arrangements to define the conditions under which they can accept them.

In international metrology community, for example, the International Committee of Weights and Measures (CIPM) initiated the Mutual Recognition Arrangement (MRA) to provide governments and other parties with a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs. It was signed in 1999 by the representatives of 38 NMIs all over the world. The purpose of the MRA is to provide the basis for securing the inter-reliability on the testing and measurement standards.

Having recognized the importance of CRMs for promoting a common European measurement system in food safety and quality, anti-fraud, health, environment, nuclear safety and security, European Commission (EC) established the Institute for Reference Materials and Measurements (IRMM) in 1957 which is currently located in Geel, Belgium (Tel: +32 14 571 211, Fax: +32 14 584 273, Website: http://www.irmm.jrc.be).

The primary mission of the IRMM is to promote a common European measurement system especially for internal market, environment, health and consumer protection standards by developing specific reference measurements, producing certified reference materials, organizing international measurement evaluation program, establishing trans-national data bases, and carrying out pre-normative research. The Institute collaborates (particularly in the area of Metrology in Chemistry and Radio-nuclide Metrology) closely with its national partners, namely the national metrology institutes (NMIs) and the Regional Metrology Organizations (RMOs) such as

EUROMET, EURACHEM, or EA.

Ensuring accurate and compatible measurements through the development, certification, and distribution of Standard Reference Materials (SRMs), the National Institute of Standards and Technology (NIST), USA has also been operating Standard Reference Materials Program (SRMP). The NIST is currently producing about 1300 SRMs available for use in industrial materials production and analysis, environmental analysis, health measurements, and basic measurements in science and technology.

However, the cost for the development and production of CRMs is too much to be afforded by only one NMI. In order to solve this problem, the NIST agreed to cooperate in the joint development of CRMs with LGC of UK, BAM of Germany and IRMM.

On the contrary, most countries in the Asia-Pacific region do not have any specialized organizations for the development and distribution of CRMs in a national and regional level. Even in Korea and Japan, they are lack of appropriate technical staff and facilities with limited capabilities in the development, production and distribution of CRMs although they have enjoyed international reputations in measurement capabilities proven by key comparisons which were organized by the International Committee on Weights and Measure (CIPM). In case of China, it has a great deal of demand for CRMs at the national level, but most of them are lack of internationally recognizable traceability yet.

Thus, the establishment of an international CRM network initially between China, Japan, Korea and Taiwan is considered to be important as a means of reducing technical barriers to trade in the region if their needs are to be met properly.

The proposed seminar was organized at the Korea Research Institute of Standards and Science from October 13 ~ 16, 2003 with the representatives from several countries in

the Asia-Pacific region to discuss a possibility to establish a network for multilateral cooperation in the production and distribution of CRMs. Particularly, in order to seek linkage of this project with the regional metrology organization (RMO) in the Asia-Pacific region, the seminar happened in conjunction with the Workshop of Gas Working Group of Asia-Pacific Metrology Programme (APMP).

2. Participants List

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3. Program *(Photographs taken during the seminar are attached in Annex A.)*

SEMINAR ON THE DEVELOPMENT OF A PROSPECTIVE INTERNATIONAL CRM NETWORK IN CONJUNCTION WITH APMP TCQM GAS WORKING GROUP WORKSHOP

October 13 ~ 16, 2003

ORGANIZED BY
THE KOREA RESEARCH INSTITUTE OF STANDARDS AND SCIENCE (KRISS)
KOREAN AGENCY FOR TECHNOLOGY AND STANDARDS (KATS)

SPONSORED BY
THE UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)
APMP TECHNICAL COMMITTEE FOR AMOUNT OF SUBSTANCE (TCQM)
APMP AD-HOC WORKING GROUP FOR THE EVALUATION OF MATERIALS PROPERTIES

October 13 (Mon)

09:30 ~ 09:40	Welcome address Dr. In Won Lee, Vice President, KRISS
09:40 ~ 09:55	*"Introduction of UNIDO Program on Capacity Building in Technology Diffusion and Market Access"* Mr. Vladimir Kozharnovich, Program Manager, Industrial Promotion and Technology Branch, Programme Development and Technical Cooperation Division, UNIDO
09:55 ~ 10:10	*"Why Certified Reference Materials are Essential for Materials Metrology?"* **(Project Report)** Dr. Gun Woong Bahng, Principal Researcher, Division of Chemical Metrology and Materials Evaluation, KRISS
10:10 ~ 10:20	Group Photograph
10:20 ~ 11:20	*"Certified Reference Materials – the European Perspective"* **(Invited Lecture I)** Dr. Doris Florian, Unit Head,

	European Commission, Joint Research Centre, Institute for Reference Materials and Measurements (IRMM), Belgium
11:20 ~ 12:20	*"An International CRM Network"* **(Invited Lecture II)** Dr. Hun Young So, APMP TCQM Chair/Principal Researcher, Division of Chemical Metrology and Materials Evaluation, KRISS
12:20 ~ 13:30	Lunch
13:30 ~ 14:00	**Report Presentation I** Prof. Yadong Yu, Director, National Research Center for Certified Reference Materials (NRCCRM), P. R. China
14:00 ~ 14:30	**Report Presentation II** Ms. Chin-I Huang, Chemistry Associate Researcher, Measurement Standards & Technology Division, ITRI Center for Measurement Standards (CMS), Chinese Taipei
14:30 ~ 15:00	**Report Presentation III** Dr. Koichi Chiba, Deputy Director, National Metrology Institute of Japan (NMIJ)/AIST, Japan
15:00 ~ 15:20	Break
15:20 ~ 15:50	**Report Presentation IV** Dr. Laurie Besley, Project Leader, Chemical Metrology, CSIRO National Measurement Laboratory, Australia
15:50 ~ 16:20	**Report Presentation** Dr. Jin Seog Kim, Principal Researcher, Division of

Chemical Metrology and Materials Evaluation,
Korea Research Institute of Standards and Science (KRISS),
Korea

16:30 ~ 17:30 Lab Visit (Organic and Inorganic Analysis Labs)

- 18:30 ~ Welcome Dinner

October 14 (Tue)

09:00 ~ 10:30 Round Table Discussion I
(Development of an International Network of CRMs)

10:30 ~ 10:50 Break

10:50 ~ 12:00 Round Table Discussion II
(Development of an International Network of CRMs)

12:00 ~ 13:00 Lunch

APMP TCQM Gas CRM Workshop

13:00 ~ 13:10 Welcome address
Dr. Hun Young So, APMP TCQM Chair

13:10 ~ 13:20 Welcome address
Dr. Hyeong-Ki Choi, Director, Korean Agency for
Technology and Standards (KATS), Korea

13:20 ~ 13:30 Introduction of the Gas CRM Workshop
Dr. Jin Seog Kim, Principal Researcher, KRISS, Korea

13:30 ~ 14:00 "*A standard reference photometer (O3-SRP) for the measurement of Ozone in KRISS*",

Dr. Jin-Chun Woo, KRISS (Korea)

14:00 ~ 14:40 *"NMIJ Balances Using an Electronic Mass-Comparator for the Gravimetric preparation"*, Dr. Nobuhiro Mastumoto, NMIJ (Japan)

14:40 ~ 15:00 Break

15:00 ~ 15:40 *"Calibration gas mixtures of water in nitrogen preparation by a dynamic volumetric method. A new quick method to determine the micro-trace water in highly purified gases"*, Dr. Zeyi Zhou, NRCCRM (P. R. China)

15:40 ~ 16:20 *"High purity CRMs as traceability sources of standard gases in Japan"*, Dr. Kenji Kato, NMIJ (Japan)

16:20 ~ 16:40 Break

16:40 ~ 17:20 *"The traceability system for the quantity of gas composition"*, Prof. Yadong Yu, NRCCRM (P. R. China)

17:20 ~ 18:00 *"Reliability and accuracy of self-made standard gases by Deokyang Energen"*, Dr. Taeck-Hong Lee, Deokyang Energen Corp., (Korea)

October 15 (Wed)

09:00 ~ 09:40 *"The Development of VOC standard gases and international comparison CCQM-K22"*, Mr. Tetsufumi Harusue, CERI (Japan)

09:40 ~ 10:20 *"Primary standard for green house gas mixtures in Korea"*, Dr. Jin-Seog Kim, KRISS (Korea)

10:20 ~ 10:40	Break
10:40 ~ 11:20	*"Recent activities in special gas mixtures at CSIRO/NML"*, Dr. Laurie Besley, CSIRO/NML (Australia)
11:20 ~ 12:00	*"The Quality Assurance for the Certificate Analysis of the Gas CRM in CMS"*, Mr. Ming-Je Kao, CMS (Chinese Taipei)
12:00 ~ 13:00	Lunch
13:00 ~ 13:40	Representative from Takachiho (Japan)
13:40 ~ 14:20	Representative from Taipei (II)
14:20 ~ 14:40	Break
14:40 ~ 15:20	*"Laboratory accreditation system in Korea"*, Dr. Gyung Ihm Rhyu, KATS (Korea)
15:20 ~ 16:00	*"The Supply System for Standard Gas in Japan"*, Mr. Masaaki Maruyama, CERI (Japan)
16:20 ~ 17:00	*"Activity of ISO TC in Korea"*, Dr. Airan Han, KATS (Korea)
17:00 ~ 17:20	Break
17:20 ~ 18:30	APMP TCQM Gas WG Meeting (Bilateral Comparison of Gas CRMs)

- 18:40 ~ Farewell Dinner

October 16 (Thu)

09:00 ~ 14:00 Technical visit (Gas Science Museum, Incheon)

4. Summary of Lectures

Why Certified Reference Materials are Essential for Materials Metrology?

(Dr. Gun Woong Bahng, KRISS, Korea)

With the emergence of the WTO system, the alignment of standards in testing, calibration and accreditation has become one of the critical problems to establish worldwide free trading system. Particularly, the importance of conformity assessment in trade was already noted in the 1994 agreement on Technical Barriers to Trade. In 1999, 38 national metrology institutes (NMIs) signed a Mutual Recognition Arrangement at BIPM. In order to secure the equivalence in calibration among the NMIs who signed the MRA, BIPM launched a program known as 'Key Comparison'. In 2001, laboratory accreditation bodies of ILAC signed MRA to promote the acceptance of test and calibration data. The aim of the ILAC MRA is to develop a global network of accredited testing and calibration laboratories to realize the dream of tested once and accepted everywhere.

Having recognized the vital importance of materials measurement and testing technology in trade, the G7 countries already initiated in 1987 a multilateral program know as the Versailles Project on Advanced Materials and Standards (VAMAS) and they have been cooperating each other for the last 15 years. Now it became a worldwide concern with the increase of trade in material products and it is no more a problem that could be dealt by the G7 countries only. Recently AMPM approved to set up an ad-hoc working group in materials properties evaluation to promote development of standards in materials testing and standardization through international cooperation. These activities could be interpreted as a part of worldwide effort to establish standards for material

metrology.

In the lecture, all these trends in international communities were reviewed and a discussion was made about why the CRMs are important for the materials metrology.

Certified Reference Materials – the European Perspective (Invited Lecture I)

(Dr. Doris Florian, IRMM, EU)

In the lecture, there were introductions of the IRMM and its role in Europe. Concerning the CRMs, a lecture was made particularly about why the EU need them, what they are used for, how they can have confidence, and how they can help to get confidence in measurements.

The emphasis wad put on the facts that reliable measurement is an essential tool fo modern society, mutual acceptance of measurements require confidence in their reliability, and CRMs are a cornerstone in providing confidence in measurements.

An International CRM Network (Invited Lecture II)

(Dr. Hun Young So, KRISS, Korea)

Among the APMP members, only four major (4) economies are producing CRMs. They are respectively National Analytical Reference Laboratory (NARL), Australia; National Research Center for Certified Reference Materials (NRCCRM), P. R. China; National Metrology Institute of Japan (NMIJ) and Chemicals Evaluation and Research Institute (CERI), Japan; and Korea Research Institute of Standards and Science (KRISS), Korea.

These organizations need cooperation for the establishment of an international CRM center whose functions include producing CRMs through multilateral

cooperation and distribute them to the region; conducting joint research projects for the development of CRMs in cooperation with APMP; developing proficiency test schemes in cooperation with APLAC; and organizing educational programs for the developing economies in the region.

This center will possibly respond to the demand of CRMs specifically needed in the region and act as a focal point to promote the proper use of CRMs for the facilitation of the availability of CRMs.

Report Presentation I

(Prof. Yandong Yu, P. R. China)

The status of CRMs development, the ways of traceability and administration in China were summarized in the lecture. In addition, the outline of CRMs-related researches, international exchanges of relevant information, and the procedures of CRMs' certification and accreditation in China were introduced.

Another topics in the lecture were about the uncertainty evaluation of the CRMs, the application of CRMs in traceability, quality control and measurement quality assurance in China.

Report Presentation II

(Ms. Chin-I Huang, Chinese Taipei)

The Center for Measurement Standards (CMS) conducted a questionnaire survey in 2001 on the market demand of reference materials (RMs) in Chinese Taipei in order to analyze the current status of markets and to evaluate the feasibility for the development of RMs

From the market survey, it was found that the RMs markets depend on the import

of more than 65 % of RMs from foreign companies. Although the total demand of RMs in Chinese Taipei is over 35 million US dollars each year, it is stil in the beginning stage for the accreditation management and manufacturing of RMs.

Therefore, it is necessary to take advantage of international experiences to manage the quality of RMs and to assist the domestic producers to improve their compatibility.

Report Presentation III

(Dr. Koichi Chiba, Japan)

National Metrology Institute of Japan (NMIJ) is currently responsible for the production of SI traceable certified reference materials in Japan. The chemical metrology group of NMIJ consists of three divisions: the inorganic analysis division, the organic analysis division and the materials characterization division. At present, 35 staff members are working on chemical metrology, together with 42 post-doctoral scientists, visiting researchers and technicians. NMIJ is now studying on the development of highly precise and sensitive analytical methods, which provide good traceability to SI. It is also engaged in the production of certified reference materials according to ISO Guide 34 and 35. Its technical competence for production was audited by the CCQM peer reviewers last October, and NMIJ is now accredited as a certified reference producing organization by NITE.

NMIJ is currently providing reference materials through two different schemes, that is, JCSS (Japan Calibration Service System) and NMIJ CRM system (Certified Reference Material System). The JCSS is based on the Japanese Measurement Law, in which basic standards such as standard gases, metallic standard solutions, organic standard solutions, pH standards necessary for calibration purposes. On the other hand, the NMIJ CRMs prepared and certified according to ISO Guide 34 and 35 are being used in chemical laboratories for validation of analytical methods,

analytical quality assurance, etc. NMIJ has so far provided a total of 140 reference materials. Gas standards (30 items), inorganic standard solutions (35), pH standard solutions (6), and organic standard solutions (33) are being provided through the JCSS. On the other hand, pure organic and inorganic CRMs (9), environmental natural-matrix CRMs (3), polymer CRMs (9), advanced materials CRMs (17), and other gas standards (3) have been produced as NMIJ-CRMs and distributed worldwide.

NMIJ is now planning to develop and supply a total number of 250 standards until 2010. First of all, NMIJ is going to increase the number of basic standards available to meet a maximum requisite level. Secondly, NMIJ gives a high priority to the standards essential for safety and quality of life, for example, sediments, natural water and air-born particles CRMs for environmental protection, and also to the standards required by high-technology industries such as multi-layer standards, ion-implanted Si wafer standards and nano-pore standards. Furthermore, NMIJ is going to extend our CRM products to cover those in new and challenging fields such as bioanalysis, clinical chemistry, food analysis, and nano-technology in the next 5 years.

Report Presentation IV

(Dr. Laurie Besley, Australia)

Within Australia, there are currently only two organisations that are CRM producers. They are the National Analytical Reference Laboratory (NARL), part of the Australian Government Analytical Laboratories (AGAL); the National Measurement Laboratory (NML), part of the Commonwealth Scientific and Industrial Research Organisation (CSIRO);

NARL is by far the largest CRM producer in Australia, having a catalogue of some 250 CRMs, predominantly pure-substance organic chemicals, but including a few

matrix CRMs. Sales are of the order of 1000 units per year, and demand has grown over the past two years by about 20% per year. Sales are made to both Australian clients and customers outside Australia, though the proportion of sales in each of those categories varies substantially depending on the nature of the CRM.

NARL is continuing to expand both its range of CRMs and the fields of activity for which they are relevant, through an R&D program designed to address Australia's national priorities. Typically some 10 to 20 new CRMs are added to NARL's range each year.

NML has been developing a capability to produce reference gas mixtures for the past three years but has only begun to produce CRMs for distribution to external clients in the last 12 months. Two fields are being addressed, the natural gas industry, and the greenhouse gas area. NML does not compete with existing commercial suppliers of reference gas mixtures, but aims to strengthen the position of the Australian companies' active in that area by providing traceability to national standards for their products.

Only some three or four CRMs have been supplied by NML at this stage. Demand in both the natural gas field and for special-purpose mixtures would, however, appear to be strong and strong growth is expected over the coming years.

From July 1, 2004, these two laboratories will both leave their present parent bodies to become part of a new government body, that will possibly be called the Australian National Measurement Institute (ANMI). From that date, therefore, all of the current CRM production in Australia will be centred on ANMI.

Report Presentation V

(Dr. Jin Seog Kim, Korea)

APMP criteria for accepting a quality system include the implementation of a quality system satisfying ISO/IEC 17025 (or for reference material producers , ISO Guide 34 or ILAC Guide 12) and Technical competence to provide a calibration and measurement service that can deliver the uncertainties claimed.

Having been certified to the ISO 9001 by a domestic certification body (Korean Foundation for Quality, KFQ), the KRISS quality systems on calibration, testing and production of reference materials are being operated in accordance with ISO/IEC 17025 and ISO Guide 34. In order to meet the technical requirements of MRA on quality systems, peer reviews have been made in 12 areas from 2001 ~ 2002 by the experts of the overseas NMIs.

The number of CRM produced by KRISS amounts to 381 items consisting of 273 for chemical composition, 93 for physical property, and 15 for engineering property.

RM producers in Korea include 10 specialty gas companies, 1 steel institute, 1 geology institute and 1 chemical solution laboratory. At present the Korea Laboratory Accreditation Scheme (KOLAS) conduct lab accreditation for RM producer.

5. Conclusion

The objectives of the seminar are to discuss the demands of CRMs from the industries of participating economies for strengthening their technical capabilities in analytical quality control, to explore the roles of a possible international CRM network for the contribution to reducing technical barriers to trade, and to draw up a strategic plan for promoting multilateral cooperation in the production and distribution CRMs.