

Progress Report on Radionuclide Metrology (2005-2007)

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1. Research Activities

▶ Standardization of Radionuclides :

- Activity measurements of Ba-133 by $4\pi \beta - \gamma$ coincidence counting method.
(APMP.RI(II)-K2.Ba-133), Pilot Lab. ; NMIJ (Japan)
- Activity measurement of I-131 by $4\pi \beta - \gamma$ coincidence counting techniques.
(APMP.RI(II)-K2.I-131), Pilot Lab. ; KRISS (Korea)
Key comparison of I-131 will be reorganized by decision of TCRI/APMP meeting.
- Activity measurement of Fe-55 by x-ray spectrometry using calibrated sources of Cr-51, Mn-54, Co-57, and Zn-65.

▶ Development of equipments and facilities:

- $\beta(\text{LS}) - \gamma$ coincidence counting system. (In progress)
 - Comparison study with $4\pi \beta(\text{PPC}) - \gamma$ coincidence counting
- Construction of a low background Gamma-ray spectrometry system for low level environmental activity measurement.
 - Active shielding with plastic detectors.
 - Efficiency of HP Ge detector ; 120 %.
- Establishment of radiochemical laboratory for radionuclide analysis and measurement in the environmental sample.
 - Set up of electro-deposition system for α -emitting radionuclide.
 - Facilities of radiochemical experiment for radionuclide separation and purification.
 - Equipments for pretreatment of environmental sample
 - Alpha-ray spectrometry system for activity measurement of α -emitting radionuclide.

2. International Activities.

- APMP intercomparison : Ba-133, I-131
- CMC review for other RMOs
- Participation of APMP/TCRI meeting (India)
- Participation of IEC (Lyon, France) and ISO (Madrid, Spain) meeting.

3. Laboratory Services

- Dissemination of radioactivity CRMs. (200 CRMs / y)
- Technical consultation to the industry.
- Calibration and test services for radiation detectors and radionuclides.
- Technical training for radiation workers.

4. Future Work

- Standardization of nuclear medicine nuclides and dissemination of their standard sources. (Ga-67, Tc-99m)
- Participation of BIPM/SIR comparisons (Eu-154, Eu-155, I-131)
- Participation of CCRI key comparison (Kr-85)
- Participation of TCRI/APMP key and trial comparisons (I-131, C-14)
- Standardization of radionuclides (Mn-54, Cr-51, Cs-137)
- Improvement of digital coincidence counting technique. (In progress)
- Study on the radioactive contamination in the field of environment and food.
- Regulatory study on the natural radioactivity in commodities.
- Development of CRMs for food and environmental materials.

5. Others

- KRISS will be reviewed about technical competence in the field of ionizing radiation by 2 experts from abroad in order to meet the technical requirements of ISO 17025 for June 14-17, 2007.
 - Reviewers: Y. Hino from NMIJ, Japan and M. Kralik from CMI, Czech Republic.
- Reorganization of KRISS.
 - Division of Metrology for Quality Life was formed. Ionizing Radiation Group was

divided into Health Metrology Group and Environment and Food Metrology Group. Dosimetry and neutron standards belong to the former group and radioactivity standards to the latter group.

6. Publications

- K.B. Lee, Jong Man Lee, and Tae Soon Park, “Use of Penelope Monte-Carlo technique for metrology in nuclear medicine”, NMIJ-BIPM Workshop on the Impact of Information Technology in Metrology May 18-20 (2005).
- M.M. Be, et. al., “Activity measurement and gamma emission intensities determination in the decay of Zn-65”. CEA-R-6081 (2005).
- S.-H. Lee, J. La Rosa, J. Gastaud, P.P. Povinec, “The development of sequential separation methods for analysis of actinides in sediment and biological materials using anion exchange resins and extraction chromatography.” *Journal of Radioanalytical and Nuclear Chemistry* Vol. 263, 419-425 (2005).
- M. K. Pham¹, J. J. La Rosa, S.-H. Lee, B. Oregioni and P. P. Povinec, “Deposition of Sharan dust in Moanco rain 2001-2002: radionuclides and elemental composition.” *Physica Scripta*. Vol. T118, 14–17 (2005).
- S.-H Lee, et. al., “The distribution of ⁹⁰Sr, ¹³⁷Cs, ²⁴¹Am and ^{239,240}Pu in sediment of the Northwest Pacific Ocean.” *Marine Geology*, Vol. 216, 249-263 (2005).
- J. La Rosa, et. al., “Recent developments in the analysis of transuranics (Np, Pu, Am) in seawater.” *Journal of Radioanalytical and Nuclear Chemistry* Vol. 263, 427-436 (2005).
- Han Yull Hwang, K,S, Sung, K.B. Lee, Jong Man Lee, Tae Soon Park, “Standardization of radionuclide by beta(LS)-gamma coincidence counting using the geometry-efficiency variation method.” *Applied Radiation and Isotopes* 64, 1119-1123 (2006).
- K.B. Lee, Jong Man Lee, Tae Soon Park, P.J. Oh, “Preparation and activity measurement of electrodeposited alpha-emitting sources.” *Applied Radiation and Isotopes* 64, 1260-1264 (2006)
- S.-H. Lee, et. al., “Distribution of anthropogenic radionuclides in the water column of the southern-western Mediterranean Sea.” *Radionuclides in the Environment. International Conference on Isotopes in Environmental Studies Aquatic Forum 2004, 25-29 October, Monaco Elsevier, Amsterdam, 137-147 (2006).*
- G. H. Hong, C. S. Chung, S. -H. Lee, S. H. Kim, M. Baskaran, H. M. Lee, Y. I. Kim, D. B.

- Yang, C. K. Kim, "Artificial radionuclides in the Yellow Sea: Inputs and redistribution." Radionuclides in the Environment. International Conference on Isotopes in Environmental Studies Aquatic Forum 2004, 25-29 October, Monaco Elsevier, Amsterdam, 96-133 (2006).**
- M.K.Pharm, J. Gastaud, J. La Rosa, S. -H. Lee, I. Levy-Palomo, B. Oregioni, P. P. Povinec, "Recent IAEA reference materials and intercomparison exercises for radionuclides in the marine environment." Radionuclides in the Environment. International Conference on Isotopes in Environmental Studies Aquatic Forum 2004, 25-29 October, Monaco Elsevier, Amsterdam, 617-628 (2006).**
- A. Nouredine, M. Menacer, R. Boudjenoun, M. Benkrid, M. Boulahdid, M. Kadi-hanifi, S.-H. Lee, P.P. Povinec, "¹³⁷Cs in seawater and sediment along the Algerian coast." Radionuclides in the Environment. International Conference on Isotopes in Environmental Studies Aquatic Forum 2004, 25-29 October, Monaco Elsevier, Amsterdam, 156-164 (2006).**
- M.K. Pharm, et. al., "Certified reference material for radionuclides in fish flesh sample IAEA-414 (mixed fish from the Irish Sea and North Sea)." Applied Radiation and Isotopes. Vol. 64. 1253-1259 (2006).**