



Summary of the NUSIMEP Workshop:

Measurement of uranium and other actinide isotopes in environmental samples

15-17 March 2006, JRC-IRMM, Geel, Belgium

A workshop was held at JRC-IRMM for all those interested in the measurement of uranium and other actinide isotopes in environmental samples. It was the first workshop of this type organised within the frame of the NUSIMEP programme and its aim was to:

- promote contacts between participants of NUSIMEP campaigns
- discuss best analytical methods to be applied for uranium and other actinides measurements
- compare results and discuss possible reasons for biases observed in the measured results
- set out the directions of future campaigns (matrices and isotopes)



Over twenty participants from fifteen countries attended the workshop.

In the first part of the workshop the methods and basis of the NUSIMEP campaigns were given by colleagues working at JRC-IRMM (sample preparation procedures, certification measurements, etc). Participants then presented their methods and problems encountered with the measurement of the NUSIMEP samples.

At the end of this two-day meeting discussions were held on the needs for campaigns like NUSIMEP and in what way the campaigns should be optimised in the future. The topics discussed included nuclides (elements and isotopes) and their concentrations, the type of matrix required, and the need for 'realistic' samples. The JRC-IRMM viewpoint was to produce samples with good certified values even if this implied the sample matrix would not be completely realistic.

Other points noted in the discussion were:

- It is useful for participating laboratories to also have the concentrations as well as the isotopic ratios of the analytes certified in environmental samples
- A simulated, as opposed to a real, environmental matrix is quite acceptable for testing and quality control purposes
- Uranium concentrations up to a factor 100 times lower (i.e. less than 100 ppt) in a simulated urine solution would be a better test for laboratories measuring uranium in human urine
- The plutonium concentration in the last NUSIMEP campaign was high enough to be quite easily measured, as shown also by the excellent agreement between results submitted by participants for the two samples containing plutonium. For future campaigns the concentration of plutonium should be lower
- Measurement of Cs isotopes by gamma spectrometry required up to 3 days with the concentrations provided in NUSIMEP 5: lower concentrations would be possible but would then demand longer counting times

- A bias was noted for some of the measurements of $n(^{234}\text{U})/n(^{238}\text{U})$ by alpha spectrometry but could not immediately be explained
- The provision of spikes and isotopic reference materials in the right concentrations in simple disposable vials would be welcomed by many laboratories
- Other alpha and gamma-emitters are measured in environmental samples: the nuclides that JRC-IRMM can include depend, however, strongly on which ones are currently available at the institute

Several participants commented that they would welcome further NUSIMEP campaigns and further workshops of this type.

On the morning of the third day (17 March) a combined meeting was held between the participants of the NUSIMEP workshop and those of a parallel workshop, the CCQM P48 campaign in which uranium isotopic ratios in samples with the same basis as those used for the NUSIMEP 4 campaign were measured by selected laboratories.

Presentations by JRC-IRMM

Why NUSIMEP? Overview of the NUSIMEP campaigns

Roger Wellum

Preparation of matrix for NUSIMEP 4 and 5, measurement of natural uranium residue

Anna Stolarz

Certification of uranium Isotope Reference Materials at IRMM

Stephan Richter, Adolfo Alonso-Muñoz, W. De Bolle, Heinz Kühn, Philip Taylor, Jan Truyens, André Verbruggen, Roger Wellum

NUSIMEP 4: sample preparation and comparison of the results

Anna Stolarz, Adolfo Alonso, Willy De Bolle, Andre Moens, Emanuel Ponzevera, Christophe Quélet, Stephan Richter, Andre Verbruggen, Roger Wellum

Introduction to NUSIMEP 5 campaign

Roger Wellum, Ljudmila Benedik, Anna Stolarz

NUSIMEP-5: Certification of $^{238}\text{Pu}/^{239+240}\text{Pu}$ activity ratio

Goedele Sibbens

^{134}Cs and ^{137}Cs for NUSIMEP 5, Preparation - Quality Control

Timos Altitzoglou

NUSIMEP 5: Comparison of participants' results

Ljudmila Benedik

NUSIMEP 5: Verification of U & Pu Isotope Ratios using the "Multiple Ion Counting System" of the Triton TIMS

Stephan Richter, Adolfo Alonso-Muñoz, Ljudmila Benedik, Anna Stolarz, André Verbruggen, Roger Wellum

NUSIMEP 5: Evaluation of questionnaire

Ljudmila Benedik

Comparison of the results submitted by participants of NUSIMEP 4 and CCQM P48

Roger Wellum, Anna Stolarz

Presentations by participants

(in alphabetical order)

Analysis of NUSIMEP 5 Samples at Institute of Isotopes in Budapest

Zs. Varga, Zs. Stefanka, T. Biro

Institute of Isotopes of the Hungarian Academy of Science, Budapest, Hungary

Activity Measurements at Radionuclide Metrology Laboratory at Vinca Institute

Mirjana Djurasevic

Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

Analytical laboratories at SCK-CEN, Measurements relevant to NUSIMEP

Mireille Gysemans

SCK-CEN, Mol, Belgium

Post-irradiation examination of nuclear fuel by HPLC-MC-ICP-MS. The challenge of non-natural isotope ratios

Niko Kivel

Paul Scherrer Institut, Villigen, Switzerland

Environmental Management at Sellafield

Clive Lythgoe

British Nuclear Group, Whitehaven, UK

Report on New Brunswick Laboratory activity

Peter Mason

New Brunswick Laboratory, US Department of Energy, Chicago, USA

High precision uranium isotope measurement in human urine

Randall Parrish (University of Leicester & NIGL-BGS), Matt Horstwood, Vanessa Pashley, Steve Parry (NERC Isotope Geoscience Labs, British Geological Survey), Matthew Thirlwall (Royal Holloway University of London), James Anderson (formerly Harwell Scientifics) NIGL, British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham

U isotope ratio measurements using sector field ICP – MS

Iliia Rodushkin

Analytica AB, Luleå Sweden

Ultra-trace Analytical Technique for Safeguards Environmental Samples at JAEA Clean Laboratory

Satoshi Sakurai

Japan Atomic Energy Agency, Tokai-mura, Naka-gun, Japan

Spectrometric analysis of the NUSIMEP 5 samples at Radionuclide Metrology Laboratory at Vinča Institute

Ivana Vukanac

Institute of Nuclear Sciences Vinča, Belgrade, Serbia and Montenegro

NUSIMEP 5 LLNL analytical methods

Ross Williams

Lawrence Livermore National Laboratory, Livermore, California, USA