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REFERENCE MATERIALS PRODUCED FOR A EUROPEAN METROLOGICAL RESEARCH PROJECT FOCUSSING ON MEASUREMENTS OF NORM

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ABSTRACT
The planet and its atmosphere contains many different NORM radioactive species and all minerals and raw materials contain radionuclides of natural origin. For most human activities, the levels of exposure to these radionuclides are not significantly greater than normal background levels. Material giving rise to these enhanced exposures has become known as naturally occurring radioactive material (NORM). When such materials are being handled or processed, it is clearly necessary to determine the radionuclides present and their activity concentrations. There is a general need for environmental radioactivity solid reference materials to serve as quality control materials to achieve traceability, method validation and instrument calibration. In the context of NORM, the European Metrology Research Programme (EMRP) project IND57 (MetroNORM) addresses some of these issues by investigating present state-of-the-art and suggesting improvements and novel developments for • reference materials and sources, • in situ measurement systems and sampling methods, • standardisation and development of measurement procedures, • improvements of NORM related decay data, and • on-site and in situ testing of the measurement procedures This paper is concerned with MetroNORM work package 1 'Reference Materials and Sources' and will detail the options considered for selecting suitable reference materials to support diverse NORM-industries such as: extraction of rare earths, niobium/tantalum ore processing, TiO2 pigment production, phosphate processing industries, construction materials, metal processing and smelting, water production, recycling industries and the oil and natural gas industries. We will describe the radiological and chemical characterisation of candidate nuclides and how this information was used to generate a list of 4 reference materials (sand, TiO2, ionex resin and tuff) for further investigation and characterisation. The characterisation of the chosen materials will detail the measurements made using: • non-destructive techniques including γ-spectrometry and X-ray fluorescence, and • destructive analysis including mass spectrometry and α-spectrometry. The data analysis employed to interpret the results of the characterisation measurements will be detailed, and agreed values for certificated values of these materials will be presented, along with some additional comments about the radioactive equilibrium state of the various uranium and thorium decay series.

About the Presenter

Cyrus Larijani joined NPL in 2011 as a radiochemist for the Radioactivity Measurement Group after graduating with a BSc in Earth sciences and an MSc in Environmental Chemistry from the University of London. Cyrus is currently studying for his Engineering Doctorate at the University of Surrey, which is due to be completed by October 2016. Cyrus currently leads the work on NORM at NPL and is the main point of contact for the EMRP project MetroNorm. His research interests include NORM, production of radioactive standards and high energy proton-induced fission reactions involving Uranium isotopes.

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