Contribution ID : **132** Type : **Oral Presentation**

Rapid low-level analysis of 226Ra in groundwater samples by latest generation triple quadrupole ICP-MS

Monday, 26 September 2016 14:20 (0:20)

Content

Exploitation of mineral resources creates waste in which natural radioactive decay series isotopes, in particular 226/228Ra, 210Pb and 210Po, are often concentrated to levels that are hazardous to human health. Consequently, producers are required to comply with very stringent limits when discharging to water courses. In the United Kingdom, the discharge limit for 226Ra is 10 mBq L-1; however, 226Ra is naturally present in groundwaters where its abundance depends on local geology. Such a low regulatory target presents a serious challenge when differentiating between natural background and industrial contamination. Low-level measurements of 226Ra (half-life 1,600 years) are predominantly carried out using alpha spectrometry, which requires extensive chemical separation, followed by count times of several days to accurately determine the 226Ra content. Inductively coupled plasma mass spectrometry (ICP-MS) offers an alternative technique for detection of 226Ra, with a measurement time of only several minutes per sample. The major issues are matching the detection limits achievable by radiometric techniques and removal of potential polyatomic interferences (including 88Sr138Ba, 87Sr139La and 86Sr140Ce) that overlap with 226Ra; this usually necessitates complete chemical separation prior to measurement. A method has been developed using the latest generation triple quadrupole ICP-QQQ-MS that effectively removes these interferences without the need for prior chemical separation. The slight reduction in instrument sensitivity by introducing helium as a collision gas into the collision-reaction cell is offset by removing the contribution of interferences to the instrument background. The optimised setup has measured groundwater samples at 226Ra concentrations down to 1 Bq L-1 without prior chemical preparation. A combination of ICP-QQQ-MS with suitable pre-concentration should, therefore, result in a novel technique capable of measuring 226Ra at activities relevant to water discharge limits, whilst negating the need for extensive chemical separation and long count times, significantly increasing sample throughput.

About the Presenter

Elsje van Es is a 2nd year PhD student affiliated with University of Surrey, UK, under the supervision of Prof David Read. She is currently working in the radioactivity group at the National Physical Laboratory, London, with Dr Peter Ivanov, Dr Ben Russell and Maria Garcia-Miranda. Her research there is focused on the development and validation of rapid methods for the determination of 226Ra in low activity groundwater samples, with the intent of implementation within a mobile laboratory environment. The project includes improving existing methods complimenting standard radiometric analysis techniques as well as developing new methods for use with the department's novel ICP-MS/MS instrument.

Primary author(s) : Ms. VAN ES, Elsje (University of Surrey)

Co-author(s) : Dr. RUSSELL, Ben (National Physical Laboratory); Dr. PETER, Ivanov (National Physical Laboratory); Mrs. GARCIA-MIRANDA, Maria (National Physical Laboratory); Prof. READ, David (University of Surrey)

Presenter(s) : Ms. VAN ES, Elsje (University of Surrey)

Session Classification : Non-radiometric Measurements

Track Classification : Non-radiometric Measurements