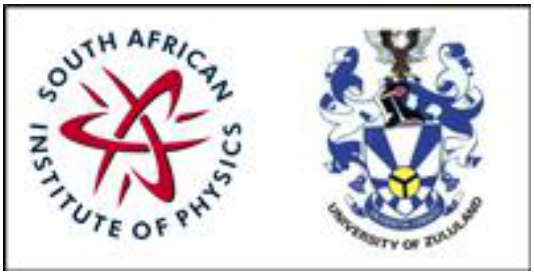

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Measuring low concentrations of naturally occurring uranium by analysing the gamma ray decays of 234Pa.

Wednesday, 10 July 2013 17:40 (1 hour)

Abstract content
   (Max 300 words)

Concentrations of natural occurring radionuclides is traditionally determined by utilising gamma ray spectra analyses. A count rate is typically extracted for a gamma ray energy window of one of the daughters of the parent isotope. Secular equilibrium between the isotopes in the decay chain of uranium (238U), like 234U, 230Th and 226Ra is however essential. The physical and chemical interaction of uranium, thorium and radium with their environment however differs substantially. This consequently creates disequilibrium amongst the daughters in the uranium decay chain which ultimately results in differences in the concentration of these daughters. The 1764 keV decay of 214Bi is predominantly preferred for this determination of uranium concentrations when utilising detectors with low resolution. Measuring of the 1764 keV decay of 214Bi would therefore provide an indication of radium concentrations opposed to natural uranium concentrations. This article investigates the prospect of utilising the 131 keV decay of 234Pa when determining the concentration of natural occurring uranium nuclides (238U and 234U). Samples were collected from various locations around South Africa and laboratory gamma ray spectra for each were obtained and analysed. The uranium and radium concentration were extracted by analysing the 214Bi and 234Pa gamma ray peaks, respectively. Comparisons were also made based on accuracy and detection limit.

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