THURSDAY

KN7 Nuclear applications of inorganic mass spectrometry

John De Laeter

Department of Applied Physics, Curtin University of Technology, Perth, Western Australia

atomic weights, neutron capture, nuclear fission, nucleosynthesis, radioactive decay.

This Plenary Lecture contrasts the thermal ionisation mass spectrometric (TIMS) techniques of the mid-1950s with modern day instrumentation. I was fortunate enough to be involved with the first TIMS laboratory in Australia with Peter Jeffery in the Physics Department of the University of Western Australia, and later completed a Ph.D in nuclear astrophysics in his laboratory. A Post-doctoral Fellowship at McMaster University in Canada, introduced me to fission product studies using TIMS. This experience led to an international study to examine the nuclear and geochemical properties of Zone 9 of the Oklo Natural Reactors, with implications to radioactive waste containment.
The Curtin Laboratory has made a significant contribution to the evaluation of the atomic weights of some 15 elements, based on the measurement of their absolute isotopic compositions [1]. The double beta decay half-life of ^{96}Zr was determined to be 9×10^{18} years by measuring the excess ^{96}Mo in ancient zircons. Our result is in agreement with the Standard Model of Particle Physics, and supports a two-neutrino mode for double beta decay. Neutron capture effects on meteoritic and lunar samples using isotopes ^{113}Cd, ^{149}Sm, $^{155,157}Gd$ which possess high thermal neutron capture cross-sections, have permitted the magnitude of the neutron flux in Solar System materials to be calculated.. P-process nucleosynthesis experiments will also be described [2].

[1] J.R. De Laeter, Mass Spectrom.Rev., 2008, 27: in press.
[2] J.R. De Laeter, Phys. Rev. C 2008, 77 : 045803 -1 to 045803-3.