

## KN2 New Frontiers in Accelerator Mass Spectrometry

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accelerator mass spectrometry

AMS today finds applications in areas as diverse as drug development, archaeology, geoscience and nuclear forensics.

Accelerator mass spectrometry (AMS) [1] is an ultra-sensitive technique for the measurement of isotopic ratios. Suppression of isobaric and molecular interferences is achieved in AMS through methods applicable to ions accelerated to energies in the MeV range.

Originally AMS found success in radiocarbon dating, with the need for only tiny amounts of carbon compared to methods based on decay counting. Many other long-lived radioisotopes, such as  $^{10}\text{Be}$ ,  $^{26}\text{Al}$ ,  $^{36}\text{Cl}$ ,  $^{41}\text{Ca}$  and  $^{129}\text{I}$ , have been analysed by AMS. While applications in environmental science and geoscience have predominated, many other areas of scientific application have been developed. Discoveries in the science of AMS itself have led to the development of compact AMS systems. Recently several such systems have been installed in laboratories involved in drug evaluation, where radiocarbon tracers are used for ADME studies.

Successful suppression of isobaric interferences is one of the key achievements of AMS. Recent work has demonstrated the measurement of  $^{39}\text{Ar}/\text{Ar}$  isotope ratios as low as  $10^{-17}$ , using positive ion AMS in conjunction with the gas-filled magnet technique for suppression of  $^{39}\text{K}$  interference [2]. Effective suppression of molecular backgrounds has made AMS the most sensitive method available for the analysis of actinides. Uranium and plutonium isotopic ratios, identified at trace levels in environmental samples, are key signatures used for monitoring the Non-proliferation Treaty [3] and in nuclear forensics.

[1] See, for example, Proceedings of the AMS-10 Conference, published in Nucl. Instr. & Meth. B 2007, 259: 1-816.

[2] P. Collon et al., Nucl. Instr. & Meth. B 2004, 223-224: 428-434.

[3] M.A.C. Hotchkis, D. Child and B. Zorko, in Proceedings of AMS-11 Conference, 14-19 September 2008, Rome, submitted for publication.