Radiometric and AMS analysis of cosmogenic radionuclides in meteorites

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Cosmogenic radionuclides, produced in the interactions of cosmic-ray particles with extraterrestrial bodies such as meteorites, provide useful information on their origin, on their path through space, their cosmic-ray exposure ages, and their dimensions. They simultaneously work as integrated detectors of both galactic and solar cosmic rays, providing information on their fluxes and variations in the past, including solar modulation of galactic cosmic rays in the space, and solar flare events in the past.

Traditionally radiometric methods, mainly low-level gamma-ray spectrometry have been used for analysis of cosmogenic radionuclides in meteorites. With the development of Accelerator Mass Spectrometry (AMS) this method has been frequently used for analysis of long-lived cosmogenic radionuclides (such as ^{10}Be, ^{14}C, ^{26}Al, ^{41}Ca, ^{53}Mn), while gamma-ray spectrometry (mainly with HPGe detectors) is mostly used for analysis of short-lived radionuclides (e.g., ^{7}Be, ^{22}Na, Co isotopes, etc.). New developments in the HPGe spectrometry of very low activity samples/meteorites, including detection systems with cosmic-ray shielding, with coincidence arrangements of detectors, as well as their operation in underground laboratories will be discussed together with applications of AMS for analysis of ^{10}Be, ^{14}C and ^{26}Al in meteorites.