AMS and Nuclear (Astro)Physics – from ^{60}Fe to the actinides: examples of exciting applications

A. Wallner[1]

[1]*Department of Nuclear Physics, The Australian National University, ACT 0200, Australia*

Accelerator mass spectrometry (AMS) represents a sensitive technique for studying long-lived radionuclides through ultra-low isotope ratio measurements. I will highlight

(i) the search for live supernova(SN)-produced radionuclides in terrestrial archives: Such studies probe directly specific nucleosynthesis sites and will help understanding heavy element nucleosynthesis in massive stars. Our new data suggest an unexpected low abundance of interstellar ^{244}Pu ($t_{1/2}$=81 Ma) - a perfect nuclide to study r process nucleosynthesis that serves also as a probe for r process sites.

(ii) the status of the ^{60}Fe ($t_{1/2}$=2.6 Ma) sensitivity at the ANU using a gas-filled magnet setup: I will discuss the newest measurement results with respect to the search of supernova(SN)-produced live ^{60}Fe in deep-sea sediments. I will also detail a new approach to determine its strongly disputed half-life value.

(iii) the simulation of stellar nucleosynthesis processes in the laboratory via the study of dedicated nuclear reactions to elucidate current open questions in astrophysics. The combination of sample activation and subsequent AMS measurement was applied where off-line decay counting is difficult or impossible.

(iv) a novel approach for neutron-capture studies of U and Th: improved and highly accurate nuclear data are urgently required for the design of advanced reactor concepts. Up to now, no measurements were performed for such reactions applying AMS. This method is the most direct approach and provides important and independent information for innovative new nuclear technologies.