Cosmogenic radionuclide research at the Vienna Environmental Research Accelerator (VERA) with special focus on avoiding chemistry (but not chemists)

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Abstract

The Vienna Environmental Research Accelerator centred on a 3 MV tandem accelerator, has been a leader in accelerator mass spectrometry (AMS) for over 30 years. Building on its history of supporting fundamental and applied research, VERA recently established a new core facility: "VERAcore". It offers enhanced staff support and expanded sample preparation labs, including "VERAcore Seed Grants" for free access to both ^{1}C and non-^{1}C research.
Technical innovation remains at VERA's core, particularly through the world-unique Ion-Laser Interaction Mass Spectrometry (ILIAMS) system. By using photodetachment to suppress isobars, ILIAMS has revolutionized ^{2}Al and ^{3}Cl measurements. For ^{2}Al, switching to AlO has increased overall efficiency to 0.23%. For ^{3}Cl, ILIAMS allows operation at a lower terminal voltage (1.75 MV) and charge state (2+), doubling detection efficiency and raising overall efficiency to 1%.

ILIAMS also enables the direct detection of ^{2}Al and ^{1}Ca in stony meteorites. Because ILIAMS suppresses isobars (Mg,K) so effectively, tedious radiochemical separation is no longer required. This has been successfully applied to recent European meteorite falls like Drélow, Elmshorn, Haag, Kindberg, Koblenz, Ribbeck and Saint-Pierre-le-Viger, but also to meteorite finds. Furthermore, VERA is testing ^{2}Al pre-screening for quartz (< 5 mg needed) to streamline sample selection before full chemical processing.
Finally, while a stacked-foil detector allowed using Be^{2} (instead of Be^{3}), thus boosting ^{1}Be stripping yields to 55%, we are still addressing background challenges in the lab. However, we are proud to announce a promising new "HF-free" method for ^{1}Be analysis in meteorites aiming to minimize hazardous chemistry.

Keywords: AMS, meteorite, isobar suppression, terrestrial age, HF, free

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