



Introduction to the Center for Analytical Science and Technology

The Center for Analytical Science and Technology (CAST) in SESS is a center for analysis and expertise training. Equipped with 39 sets of state-of-the-art instruments and devices, the CAST encourages combined efforts among scientists and engineers to advance the development of innovative analytical methods in the cross-disciplinary areas of Earth system science. Current expertise and instrumentation includes:

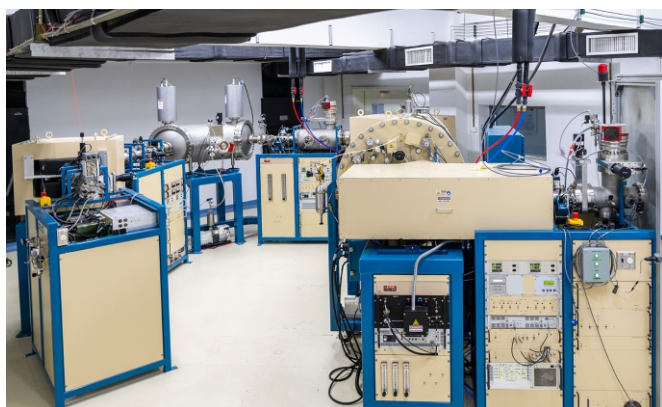
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| (1) Major/Trace Substances Analysis | (4) Traditional Isotope Analysis |
| (2) Nuclide Isotope Analysis | (5) Organic Substance Analysis |
| (3) Non-traditional Isotope Analysis | (6) Material and Morphology Analysis |

The center excels in advanced technologies such as precise measurements of ^{10}Be and ^{26}Al using a low-energy accelerator mass spectrometer, methane clumped isotopes utilizing a high-resolution isotope ratio mass spectrometer, and mercury isotopes in various forms by a multi-collector inductively coupled plasma mass spectrometer. The cutting-edge instruments to understand the planet include Nano-scale Secondary Ion Mass Spectrometer (NanoSIMS), High-Resolution Stable Isotope Mass Spectrometer (253 Ultra), Fourier Transform Ion Cyclotron Resonance Mass Spectrometer (FT-ICR MS), Accelerator Mass Spectrometer (AMS, 0.5MV), Multi-Collector Inductively Coupled Plasma Mass Spectrometer (MC-ICP-MS), Stable Isotope Ratio Mass Spectrometer (IR-MS), etc..

Analytical Facilities		Description
Isotope analysis	Traditional isotopes	With a high-resolution isotope ratio mass spectrometer (model 253 Ultra) and four gas stable isotope ratio mass spectrometers (253 Plus, Delta V series), we provide analytical facilities and technical expertise to determine stable isotope ratios of a variety of organic and inorganic materials from the terrestrial, marine and atmospheric environments. The facility has the ability to measure C, N, H, O and S in plant and animal tissue, soils, sediments, carbonates, waters and gases.
	Non-traditional isotopes	Using two multi-collector inductively coupled plasma mass spectrometers (Neptune Plus and Nu Plasma 3D), we can analyze the stable isotope composition of metals (such as Hg, Zn, Cu, Fe, Li, Mg, Ba, Ga, Sn, Sb, etc.) and provide high-quality isotopic data.
Nuclide isotope analysis		The facility has an accelerator mass spectrometer (primarily used for analyzing ^{14}C , ^{10}Be , ^{26}Al), two sets of multifunctional ^{14}C graphitization devices, a noble gas mass spectrometer and a well high purity germanium gamma spectrometer, which produce high-quality experimental data for geochronologic & thermochronologic applications in the Earth Sciences and Environmental Science. By assessing the ratios and/or concentrations of these nuclide isotopes, we can get a deeper insight into the exposure age, soil production rate, catchment-averaged erosion, and processes of Earth's varied landscapes.

Analytical Facilities	Description
Organic substance analysis	By the use of a Fourier transform ion cyclotron resonance mass spectrometer (FT-ICR MS), a gas chromatography-quadrupole time of flight mass spectrometer, and a Ultra high performance liquid chromatography-hybrid triple quadrupole linear ion trap mass spectrometer, we can provide qualitative and quantitative analysis of organic compounds to study the migration and transformation mechanisms.
Material and morphology analysis	Equipped with a Nano-scale Secondary Ion Mass Spectrometer (NanoSIMS), a thermal field emission scanning electron microscope (TFESEM), a Mossbauer spectrometer, the platform is qualified to be used for morphology observation, structure characterization and composition analysis in various research fields.

Key facilities at the CAST



Accelerator mass spectrometer
(0.5 MV AMS)



High resolution isotope ratio mass spectrometer
(253 Ultra)



Nano-scale secondary ion mass spectrometer
(NanoSIMS)



Fourier transform ion cyclotron resonance mass spectrometer (FT-ICR MS)

To utilize the shared analytical facilities above,
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