

Isotope-ratio mass spectrometer (IRMS)

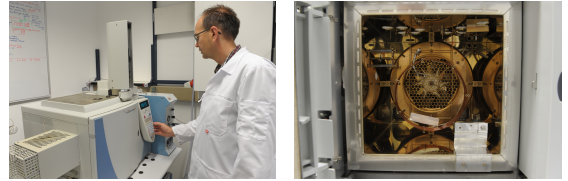
<https://labfacilities.wur.nl/SearchDetail.aspx?deviceid=f708b6e4-a5cf-472c-852a-f77b0274c580>

Brand

Thermo Scientific

Type

Delta 5



Contact

Leon de Jonge (leon.dejonge@wur.nl)

Organisation

Animal Sciences Group

Department

Animal Nutrition

Description

The IRMS is a special kind of mass spectrometer to measure the ratio between stable isotopes such as $^{12}\text{C}/^{13}\text{C}$ or $^{14}\text{N}/^{15}\text{N}$. It is a very useful technique for product authenticity and traceability studies and physiological research.

Technical Details

The IRMS is of type Delta 5 of Thermo Scientific and can be used in two different ways.

- In combination with an element analyser that allows to measure the total ratio of $^{12}\text{C}/^{13}\text{C}$ and $^{14}\text{N}/^{15}\text{N}$ in a solid sample.
- In combination with a gas chromatograph (type: Thermo Finnigan Trace), which allows the determination of the $^{12}\text{C}/^{13}\text{C}$ ratio in specific chemical components.

Applications

The geometry of the equipment contains a fixed magnetic field and ion collectors which allows an extreme accurate determination of these ratios compare to the conventional types of mass spectrometers. The difference has only to be 0.1% in the relative amount of ^{13}C or ^{15}N to make a significant differences between the ratios in samples.

Product authenticity and traceability: atmospheric differences in the stable isotope ratio and therefore in the products can be detected to determine their geographic origin. Although these differences are very small, the high accuracy of the IRMS enables researchers to discriminate between olive oil from Spain and Greece.

Physiological research: labelled chemical components are used to identify specific biochemistry pathways or digestion processes. The advantage is that the components labelled with stable isotopes are not dangerous to use and will behave comparable to those with a normal isotope ratio. For these studies, highly enriched components are infused and their disappearance or the appearance in breakdown products is estimated by using the IRMS mostly in combination with the gas chromatograph. At this moment, methods are available for the measurement of this ratio in individual amino acids, alkanes and urea. In the future further applications will be developed.

Complementary Techniques

Sample preparation: the laboratory has facilities and knowledge to conduct extraction, derivatisation, and clean up steps depending on the type of analysis.