GAM 400

mobile benchtop mass spectrometer

The GAM 400 is a mobile benchtop mass spectrometer with an internal processor. The mass range is from 1-512 amu.

Because of its open design the GAM 400 can be adapted to any application and can be combined with additional devices.

Up to three permanent gas inlets can be installed so that simultaneous measurements with different sample pressures can be performed. According to the individual application the GAM 400 can optionally be equipped with a N_2 cold trap and a batch inlet.

The GAM 400 contains a cross beam ion source, a Faraday detector and a SEM-Detector. The InProcess Software allows an internal or/and external control of valves, data aquisition and data processing.

Because of its open design the GAM 400 is perfectly suited for research and developmental applications.

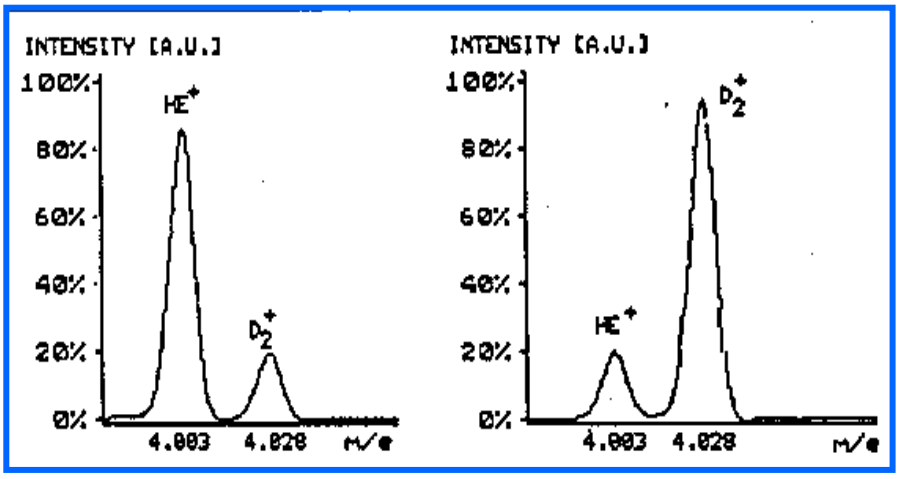
Separation of Deuterium and Helium on mass 4 amu

In nuclear fusion research it is very important to know the ratio of deuterium to helium. The use of mass spectrometry for that task has its problems because both elements are only 0,025 amu apart from each other. That corresponds to a m/Δm of 100. This means that high resolution mass spectrometers are required. Quadrupole mass spectrometers which normally operate with unit resolution are not suitable for that task. However, those that work in the mass range of > 2000 amu achieve already a resolution of m/Δm 6000 (half-width definition at 50 % height). This means that high-quality quadrupole mass spectrometers are basically able to achieve the resolution required for separating deuterium from helium.

Experiments:

For determining the achievable separation power, a QMA 410 mass filter (16 mm rod diameter, 300 mm rod length) was used in combination with a QMH 400-1 RF-generator. The crossbeam ion source was equipped with an electron guidance magnet which increases not only the sensitivity but also optimizes the entrance conditions into the quadrupole. Helium and Deuterium were mixed in various ratios through a batch inlet system and fed to the ion source via an orifice and a tube.

Results:



The results of the measurements are illustrated in the diagrams which clearly show that deuterium and helium can be well separated from each other. Due to the slight widening of the peaks toward the lower mass number, small helium concentrations in the presence of large deuterium concentrations are somewhat more difficult to detect than if the ratio is reversed. Despite of the high resolution, the resulting ion currents are still so high that it was possible to conduct all measurements with a Faraday detector.

subject to alteration

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