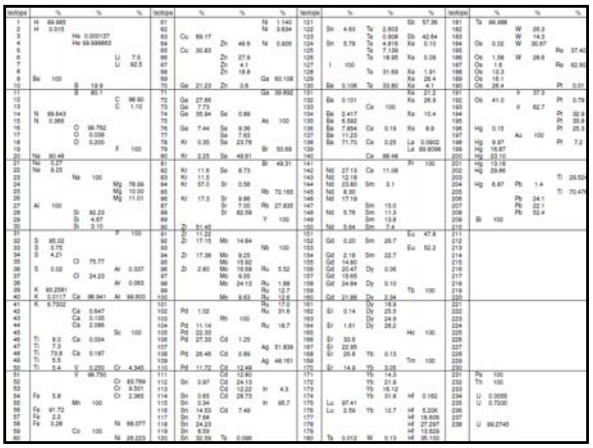
Isotope Ratio Mass spectrometry (IR-MS)

Extremely high accuracy of measuring ratios of isotope peak intensities

The principle

- **Ratios of isotope abundances** of an element in a compound are measured with very high accuracy
- Gives information about the **origin of the element** in the sample
  - The most usual elements: H, C, N, O or S

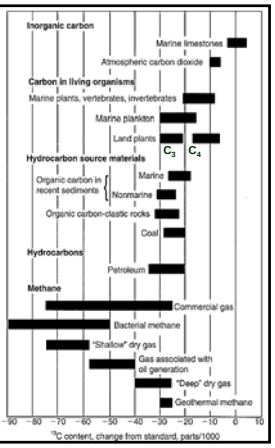


Example: carbon

- Natural elemets are mostly **mixtures of isotopes:**
- In **standard** natural C:
  - Approximately 98.9 % is ^{12}C
  - Approximately 1.1 % is ^{13}C
- In reality, depending on origin ^{13}C content can differ markedly: **isotopic fractionation**

^{13}C content of carbon depending on origin

- $\delta^{13}C$ Scale:
  - $\%^{13}C = 1.11\% \rightarrow \delta^{13}C = 0$
  - $\%^{13}C = 1.06\% \rightarrow \delta^{13}C = -44$
- Different photosynthesis pathways:
  - C_3 (wheat, rye, …)
  - C_4 (sugar cane, tropical plants



IR-MS instrument

- Carbon is often converted to CO_2