HYDROISOTOP gmbh
Laboratorium zur Bestimmung von Isotopen in Umwelt und Hydrologie

Schweitenkirchen, August 2013

Isotope of the month – ^{13}C

Carbon has two stable natural isotopes and one radioactive natural isotope (^{12}C: 98.9 %, ^{13}C: 1.1 % ,^{14}C: < 10^{-9} %, half-life of 5730 years). Of all chemical elements, carbon has the widest variety to form chemical compounds. Therefore, it opens a broad field of applications for ^{13}C in the environment and hydrology.

For example, ^{13}C is used to evaluate the carbon system of groundwaters. Thereby, the genesis, evolution and interaction of the organic and inorganic carbon compounds dissolved in groundwater can be studied. This is of tremendous importance, in particular for groundwater age-dating by using the radioactive carbon isotope ^{14}C, or rather to determine the initial ^{14}C-content at the groundwater recharge.

Also in the field of food analysis, by determining the characteristic $^{13}C/^{12}C$-ratios, the origin of the used plants, sugars and other additives can be identified. Furthermore, the $^{13}C/^{12}C$-ratio of food gives information, if illegal food additives were used in the production. The authenticity of food and of food additives can be tested, too.

Regarding organic contaminants in groundwater, such as BTEX and CHC, the $^{13}C/^{12}C$-isotope ratio of the contaminants allows differentiating if more than one input of the contaminants took place and therefore possibly different polluters are responsible. Isotope ratios of the contaminants do not change due to dilution, but due to biological degradation by bacteria. Therefore, by analysing the evolution of the $^{13}C/^{12}C$-ratio of contaminants on a study area, or along a groundwater flow path, qualitative and quantitative conclusions on the natural attenuation of the contaminants in groundwater can be drawn.

According to the substance analysed, the Hydroisotop GmbH determines the $^{13}C/^{12}C$-isotope ratios with accredited measuring methods by using isotope-ratio mass-spectrometry (IRMS) and gas-chromatograph isotope-ratio mass-spectrometry (GC-IRMS).