fractionation due to CO_2-diffusion through micropores, faults, and interfaces of solids from a CO_2-reservoir. Considering Tertiary basalts, but no recent magmatic activities in the study area, CO_2 may be referred to a subsequent liberation of CO_2-gas from respective reservoirs of the underlying rocks of the study area, which is primary gained from Tertiary basaltic magma. An accumulation of primary magmatic CO_2 may occur in reservoir rocks such as sandstones, which are secluded e.g. by clay-rich horizons of the Röt formation (Triassic) or by storage in marine evaporites. The high CO_2 content stimulates the ascent of the solutions until the earth surface is reached by an extensive formation of a gas-solution mixture.

High concentrations of silicic acid and an excess of dissolved sodium versus that derived from the dissolution of halite exhibit an intensive weathering of silicates. This appears especially in the CO_2 type and is also documented by the occurrence of kaolinite layers at the respective sites. Dissolved sulfate is mostly obtained from the dissolution of gypsum or anhydrite of the Zechstein formation. The stable sulfur isotope ratios at low SO_4^{2-} concentrations show that sulfur is also gained by the oxidation of sulfides e.g. pyrite in shales. The presence of Sr^{2+} and Ba^{2+} reflects the dissolution of carbonate minerals, whereas iron and manganese is mostly controlled by precipitation of respective oxide/hydroxides as the solutions reach the earth surface.

The evolution of LOW and BRI type solutions is quite similar to that of the CO_2 type. However, a potential source of CO_2 for the dissolution of carbonate is mainly soil-CO_2, and the BRI type solutions contain additional amounts of dissolved marine evaporates, especially halite.

High Temperature Pyrolyses - a new field for isotope analyses

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A new method for the automated sample conversion and on-line oxygen isotope ratio ($\delta^{18}O$) determination for organic and inorganic substances was developed a few years before. The samples are pyrolytically decomposed at 1400-1450°C (HTP) in presence of a nickel/ carbon powder (mixed, 10/90).
With the presented system solid and liquid samples are measurable. Organic as well as inorganic samples such as cellulose, nitrates, sulphates and phosphates of 50 - 100 µg O can be analyzed for their $\delta^{18}O$ values with a standard deviation of usually better than 0.3 ‰. Additionally, hydrogen isotopic ratios (standard deviation better than 3 ‰), carbon isotopic ratios of organic substances and nitrogen isotopic ratios of inorganic nitrogenous compounds are available in the same system.

References

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