ECCSEL Infrastructure for Isotope Characterization of Reservoirs for Subsurface CO2 Storage

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A potential solution to reduce the emission of CO₂ in the atmosphere is to store CO₂ in subsurface reservoirs. This may be in depleted gas/oil reservoirs, saline aquifers or other porous geological formations, both on shore and off shore. To avoid any hazardous incidents, it is of high importance that the reservoirs can be proven leak free and that there is a good communication within the reservoir.

A useful tool to determine the storage quality of a reservoir is to use Strontium Residual Salt Analyses (Sr-RSA). This is an efficient tool to determine the fluid connectivity of the reservoir and the caprock in horizontal and lateral directions. In addition, it can reveal the presence of barriers and baffles in a geological perspective. Sr-isotope data can also be used to calculate the extent of the barriers and moreover, use of Carbon and Oxygen isotopes measured in cemented barriers can help reveal the history of the barriers (time and temperature of the cementations).

The Geochemistry laboratory at Institute for Energy Technology (IFE) has partially been financed by Horizon 2020 and is a part of the ECCSEL infrastructure. The multi collector (MC)-ICP-MS at IFE’s Geochemical Analysis Lab performs high-precision, high-resolution, and simultaneous measurements of isotope ratios in a wide range of isotope systems. Other Isotopes systems of interest for characterize CO2 storage reservoirs, traditional and non-traditional stable and radiogenic isotopes (Sr, Pb and U, Li, Mg, Ca, Mg, Fe, Cd, Cu, Zn, and Ni), geo- and thermo-chronology, tracing fluid flow patterns, fingerprinting sources of materials, quantifying interactions in biogeochemical systems, and monitoring environmental systems.

By coupling the MC-ICP-MS to IFE’s LA-HR-ICP-MS, the simultaneous analysis of novel isotopes and trace elements in solid materials can be achieved. The laboratory is a state-of-the-art facility for measuring isotope systems to produce data to interpret: biogeochemical reaction rates and products, tracking fluid migration, evaluating fluid/rock interactions and detect CO₂ leakage in cap rock.