Determination of CO2-Solubilities in Complex Brines as Part of an Experimental Study on CO2-Sequestration on the Laboratory Scale

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Two fundamental different approaches to experimentally investigate the interaction reactions between injected CO_2, brine, and host- or caprock do exist in the literature. In the first approach a complex model brine similar to that existing at a specific locality is used to study the response of representative host- or caprock specimens that are exposed to the brine (e.g., Rochelle et al. 2002: Utsira Sand, Sleipner, Norway). However, interaction reactions of more complex salt-CO_2-H_2O systems with rock specimens at temperatures below 400 $^\circ$C are not extensively studied (Xu et al. 2007). In the second approach a simple brine chemistry (not correlated to the rock specimens) is used. The aim of these studies is to gain more fundamental knowledge of the interaction processes without applying the results to specific localities. Due to the fact of the simple chemistry, the reequilibration time between brine and model rock is 30 days and more (Rosenbauer et al. 2005, Kaszuba et al. 2005).

In the first part of our study we therefore systematically investigate the influence of more complex brine chemistries on the CO_2-solubility to mimic the diversity of prevalent cations of formation waters of various anticipated CO_2-injection sites. These CO_2-saturated brines will be then used to study the interaction between the brines and appropriate specific rock specimens.

In the second part our focus is on microstructural changes of the rock specimens used in our experiments. Pre- and post-run charges of these rock specimens will be analysed using a X-ray microtomograph (Skyscan 1172, in operation fall 2008). Representative aliquots of two porous sandstones (more 'simple' vs. 'complex' mineralogy) will be exposed to brines with complex salt chemistry derived from experiments of the first part.

Knowledge of CO_2-solubilities in brines similar in compostion to these at CO_2-injection sites and changes of the microstructure of host- and caprocks as result of CO_2-brine-rock interactions will allow statements about storage capacities and risk assessments.

References

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