Geophysical Research Abstracts,
Vol. 10, EGU2008-A-11158, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-11158
EGU General Assembly 2008

Autoclave experiments in the system sequestrated CO_2/ autochthonic biocenosis and formation waters/ rock material for the Upper Carboniferous sandstone gas reservoir Schneeren (NW-Germany)

N. Hoth (1), T. Muschalle (1), A.Kassahun (2), S. Ehinger (3), J. Seifert (3), & M. Schlömann (3)

(1) Dept. of Drilling Engineering and Fluid Mining , TU Bergakademie Freiberg, Germany, (2) Dresden Groundwater Research Centre, Germany (3) Chair of Environmental Microbiology, TU Bergakademie Freiberg, Germany (Nils.Hoth@tbt.tu-freiberg.de / Fax: 0049/(0)3731/392502 / Phone: 0049/(0)3731/393213)

The RECOBIO-project studies the minor investigated question of biogeochemical long-term transformations of stored CO_2.

The importance of the deep microbial biocenosis for aquifer systems of German oil and gas fields were first demonstrated by CORD-RUWISCH, KLEINITZ & WIDDEL [1987] and further by KLEINITZ & BAK [1991]. Mainly the sulphate reducing bacteria (SRB) were studied, which are related to the problem of acid gas (H_2S) generation. By comprehensive literature review KOTELNIKOVA [2002] summarised the importance of microbial methane formation in the deep subsurface and of chemolithoautotrophic pathways with consumption of CO_2 in general. In the project it could be shown that a H_2-generation on Fe-silicates is obvious (KASSAHUN ET AL. [2007]). This insitu H_2-supply is important for the CO_2-transformation.

The talk discusses different experimental results.

Experiment 1 underlined the generation of H_2 on Fe-chlorites and its fast consumption coupled to sulphate reduction. Within this test the sulphate content of the formation water was nearly complete reduced by SRB. The CO_2-partial pressure dropped down

due to formation of carbonate phases and autotrophic sulphate reduction.

The second experiment was conducted to investigate the differences between a sterile and a non-sterile setup under equivalent conditions. Therefore two reactors were operated with the same ratios between Schneeren rock material and produced formation water. In opposition to experiment 1 the produced formation water of well Schneeren Z2 instead of Z3 was used. This well was selected because of its significant lower sulphate concentration.

The experiment was conducted under a total pressure of 10 bar limited due to the operation conditions of the pH electrode of the reactor. A temperature of 40˚C was chosen to reduce the stress for the microorganisms.

During the experiment there was an increase of the dissolved sulphide concentrations in the non-sterile reactor. The ph-value increased from 3 to 4.8. But the main result was a sharp increase of the TOC-concentration of the liquid phase within the non-sterile reactor from a level of 100 mg/l to more than 2100 mg/l. The detailed characterisation of the liquid TOC by LC-OCD chromatography showed that the organic compounds of the non-sterile reactor belong to the “neutral or amphiphilic” fraction. A more detailed characterisation by HPLC and GC-MS will be presented. It should be noted, that the sharp rise of liquid TOC-content was found only in the non-sterilised reactor and is therefore related to the activity of the autochthonic biocenosis. The investigation of the rock material after the test by SEM-EDX showed some impressive metal-agglomerations within the biogeochemical alterated zone.