420f Thermodynamics Investigations for the Adsorption of Carbon Dioxide on Different Rocks

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This papers deals with climate change and geological sequestration. The adsorption of carbon dioxide investigation into clay minerals such as e.g. montmorillonite and kaolinite is investigated. There are three types of interactions between carbon dioxide and the bulk of geological formations. Carbon dioxide can be either trapped as a gas or supercritical fluid (so called hydrodynamic trapping), or dissolved into the groundwater (so called solubility trapping), or adsorbed on the surface of rocks or it may –after a longer period- react with minerals in the geological formations leading into the precipitation of carbonate minerals (so called mineral trapping). This sequestration process is based on carbon dioxide adsorption or absorption into the clay minerals. In our experiments, dry and wet minerals were exposed to carbon dioxide environment at temperatures 25°C and 40°C under pressure in the range of 0,01 to 150 bar. Further, the measurements of grain size dependency on the carbon dioxide ad/absorption is also presented. All investigations were carried out with high precision in a magnetic suspension balance (Rubotherm, Germany). Experiments show a surprising high loading of the minerals by CO2. Further, there are remarkable differences between the individual minerals.

Adressing to a short-term perspective an attempt is made to predict the sequestration capacity based on adsorption and solubility.