

# Siderite solubility in high pressure-high temperature H<sub>2</sub>O-CO<sub>2</sub> fluids: implications for geological storage of CO<sub>2</sub>.

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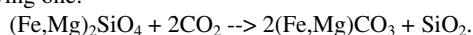
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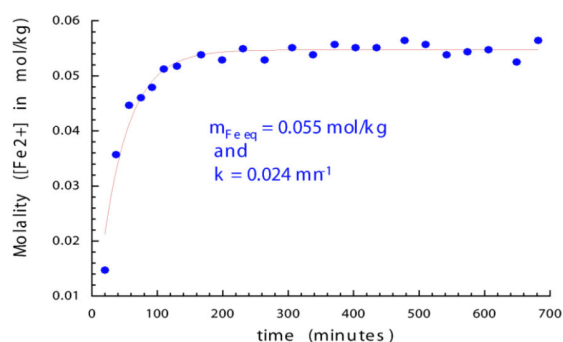
Mineral sequestration is one of the solutions studied to reduce the amount of carbon dioxide CO<sub>2</sub> in the atmosphere. In ultra-basic and basic rocks, the chemical reactions on which this technology is based are of the kind of the following one:



In the conditions of sequestration, one limiting factor of mineral sequestration is the solubility of carbonates in CO<sub>2</sub>-bearing fluids. They definitely need to be determined, as well as the kinetics of the reactions at stake, in order to assess viable storage conditions.

We studied the solubility of siderite and kinetics of the dissolution reaction in hydrothermal conditions, as a function of temperature, pH and ionic strength. The techniques involved are synchrotron x-ray absorption techniques which enable to determine *in situ* both the solubility of the mineral and the speciation of Fe(II) ions in solution.

The dependence of the solubility upon temperature, pH and chloride concentration will be presented as well as the constants and activation energy of the first order kinetics equations derived (see figure 1). Finally, thanks to the speciation data, a thermodynamic model can be safely propounded that supports the experimental results.



**Figure 1:** molality of Fe(II) from dissolution of siderite at 100°C/300bar (dots), as a function of time; the solid line is the first order kinetical fit.