Solubility of aragonite in aqueous fluids under HP-HT conditions

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Carbonate dissolution in subduction zone fluids plays a role in the carbon budget in subduction zones. Depending on the solubility of carbonate minerals, the subducting lithosphre may be either strongly depleted as recently observed in natural samples of transport carbon deeper into the Earth's mantle [1, 2]. Dissolution of carbonate minerals is strongly affected by the environmental geologic conditions leading to different aqueous carbon speciation and solubility according to the conditions of pressure and temperature. Thanks to recent advances in theoretical aqueous geochemistry [3, 4], combined experimental and theoretical efforts now allow the investigation of speciation and solubility of carbonate minerals in aqueous fluids at higher *PT* conditions than previously feasible [4, 5]. In this study, we present *in situ* X–ray fluorescence measurements of aragonite dissolution and thermodynamic model of aragonite solubility in aqueous fluids up to 5 GPa and 500°C. The amount of dissolved aragonite in the fluid was measured from the intensity of the Ca K–lines at the ESRF–ID27 using an externally-heated membrane-type diamond anvil cell and an incident monochromatic focused X–Ray beam at 20 keV. The results show a very high solubility of aragonite at HP-HT in pure water, tremendously enhanced in presence of NaCl in the solution. The data were aslo used to constrain the partitioning of Sr between the fluid and the carbonate minerals.

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