



## Quartz solubility in Na<sub>2</sub>CO<sub>3</sub> solutions

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Carbonate equilibria are among the most important reactions in natural aqueous systems. Carbonate and bicarbonate ions are second only to Cl most common anions in fluid inclusions (Roedder, 1984). It has been shown experimentally that sodium carbonate solutions depress the melting temperature of quartzofeldspathic rocks even stronger than pure H<sub>2</sub>O (Koster van Groos, Wyllie, 1968; Shaposhnikov, Aranovich, 2015). The presence of carbonic species in aqueous solutions results in significant changes in the solution pH, and consequently, strongly affects minerals' solubility. Here we present new experimental data on the synthetic quartz (Qtz) solubility in the Na<sub>2</sub>CO<sub>3</sub> (reagent grade, carefully dried before loading) aqueous (doubly de-ionized H<sub>2</sub>O) solutions ranging in salt concentration from 0.3-3.5 M (mole/kg H<sub>2</sub>O). The data have been collected in the temperature(T) range 500-700°C at 0.4 and 0.5 GPa pressure (P) in an IHPV. Phase assemblage-bracketing was used as a solubility monitor in quench experiments: first disappearance of crystalline Qtz in a succession of runs with constant Na<sub>2</sub>CO<sub>3</sub> concentration but decreasing the Qtz/solution weight ratio was taken for the solubility value. It was possible to "bracket" the solubility within about 1 wt. % by carefully observing the presence or absence of crystalline Qtz in the run products. Qtz solubility varies systematically with P, T, and particularly, with the Na<sub>2</sub>CO<sub>3</sub> molality, increasing from 0.7 M for the 0.3 M Na<sub>2</sub>CO<sub>3</sub> to 4 M for the 3.5 M Na<sub>2</sub>CO<sub>3</sub> (at 600°C/0.4 GPa). In all cases the SiO<sub>2</sub> molality in the solutions exceeds that of Na<sub>2</sub>CO<sub>3</sub>, which suggests the presence of polymerized silica species in the solutions.

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