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Water solubility in silica and quartzofeldspathic melts

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ABSTRACT

Water solubility in silica melts was determined at 100–600 MPa, 1200–1350 °C, and at each temperature (T) was found to increase with pressure (P). At $P \leq 250$ MPa, the effect of T on water solubility in silica melts is small and within analytical precision (±0.15 wt% H_2O). A positive correlation with T was observed at 400 MPa. Increasing solubility of water with increasing T was observed when large amounts of water are dissolved in silica and quartzofeldspathic melts (i.e., when molecular water is the dominant species in the glasses at room temperature), as already observed for feldspar melts. Change in water solubility (expressed in mol%) with decreasing SiO_2 content of the melt is nonlinear along the silica-albite join. In the compositional range Ab_{100} to Ab_{25} (100 to 25 mol% albite, respectively, compositions calculated on an eight-oxygen basis), the solubility of water at 200 MPa decreases only slightly with decreasing Ab content (–0.1 ± 0.01 mol% H_2O per mol% albite). However, at Ab contents less than 25 mol%, water solubility decreases sharply with increasing Qz content. Similar behavior was observed at 500 MPa. These results suggest that two different incorporation mechanisms of water in quartzofeldspathic melts must be considered: one corresponding to an $NaAlSi_3O_8$-H_2O mechanism, the other to an SiO_2-H_2O mechanism.