Water solubility in pantelleritic melts

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While there exist abundant data for water solubility in metaluminous (typical calc-alkaline) rhyolitic melt compositions, our knowledge of water solubility in pantellerites (strongly peralkaline rhyolites) remains limited, even though studies of melt inclusions in such magmas show they may be water-rich [1, 2]. To improve our knowledge of water behavior in peralkaline rhyolites we have condicted several series of new experiments at P=50 to 200 MPa and T=800-850°C using a sythetic pantellerite starting composition with (wt%) SiO_2=76.6, Al_2O_3=8.48, FeO*=5.48, K_2O=3.68, Na_2O=4.72, with molar (Na+K)/Al=1.38. Some experiments were H_2O undersaturated (~2 to 6 wt% H_2O) and the products of these experiments were analyzed by Karl-Fischer Titration (KFT) for total dissolved H_2O abundance. The results from these experiments were used to estimate new extinction coefficients for infrared absorption bands at ~4500 cm^{-1} and ~5200 cm^{-1}, commonly attributed to molecular water and hydroxyl groups, respectively. Preliminary results suggest molar absorptivity values of 1.80 and 1.62 l $mol^{-1}cm^{-1}$ for the 4500 cm-1 and 5200 cm-1 bands, respectively.

Additional water saturated experiments at 50-200 MPa, 850°C demonstrate water solubilities, on a wt% basis, in our pantelleritic composition that are significantly higher than observed H_2O solubilities in metaluminous rhyolitic compositions (approximately 1 wt% higher at 100MPa, close to 2 wt% higher at 200 MPa). In addition, trying to calculate H_2O solubilities using existing models (e.g. [3, 4]) consistently underestimates solubilities, whereas the recent model of [5] reproduces our dato within < 0.5 wt%. Current work in progress is attempting to better define observed solubility variation, as well as exploring possibilities to use Raman spectroscopy for total H_2O measurements on the same glasses we have analyzed using KFT and IR spectroscopy.

[1] Lowenstern & Mahood (1991) Bull Volc, **54**, 78-83. [2] Barclay et al. (1996). JVGR **74**, 75-87. [3] Moore et al., (1998). Am. Min. **83**, 36–42. [4] Ghiorso & Gualda (2015),. Contrib. Mineral. Petrol. **169**, 53. [5] Papale et al. (2006): Chemical Geology **229**, 78–95.

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