Cassiterite dissolution and Sn diffusion in silicate melts

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Most tin deposits are in the form of cassiterite associated with granitic rocks. To understand the formation of tin deposits, it is necessary to improve our knowledge on the saturation condition of cassiterite and the transport property of Sn in granitic melts. [1] studied the effects of f_{O2} and melt composition on SnO_2 solubility and tin diffusivity in haplogranitic melts containing about 6 wt% H_2O; however, they did not investigate the effects of H_2O content and only conducted the experiments at one pressure-temperature condition. Furthermore, their diffusion data are scattered and most likely compromised by convection during their experiments [2]. It was reported by [3] that the diffusivities of a series of trace elements (including Sn) in trachytic and phonolitic melts, with the addition of 1–2 wt.% water to the melt, increased the tin diffusivity by about one order of magnitude relative to anhydrous melts. Here, we report new cassiterite dissolution experiments in rhyolitic melts at 850-1300°C, 0.5 GPa, and 0.8-6.0 wt% H_2O, performed in a piston-cylinder apparatus to determine cassiterite solubility and Sn diffusivity as a function of temperature and H_2O content. The data have for applications for tin ore-forming processes. In this study, we characterized H_2O content accurately by FTIR both before and after the experiments. Preliminary interpretation of the data indicates that Sn diffusivity increases strongly with increasing temperature and H_2O content. More work is in progress to quantify the dependence of SnO_2 solubility and Sn diffusivity in granitic melts as a function of temperature, H_2O content and the oxidation state of tin in the melt.

[1] Linnen *et al* 1995, Geochimica Cosmochimica Acta Linnen *et al* 1996, *Geochimica Cosmochimica Acta* [2] Zhang *et al* 2010, *Reviews in Mineralogy* [3] Behrens and Hahn, 2009, *Chemical Geology*