Viscosity and structure of alkali iron silicate melts with a variety of iron oxidation state

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Assuming that structural roles of Fe^{2+} and Fe^{3+} are different, iron oxidation state (i.e. Fe^{2+}/Fe^{3+} ratio) potentially influence on the physicochemical properties of silicate melts, which are commonly formed in industrial processes (e.g. metallurgical industry) as well as in geological processes. However, the understanding of the influence of Fe^{2+}/Fe^{3+} ratio on the melt properties is very limited [1] and the influence is not enoughly combined with the melt structure. In the present study, the viscosities of the alkali iron silicate melts with a variety of iron oxidation state were measured at temperatures above their liquidus and close to their glass transition: lithium, sodium or potassium cations are contained in the melts as alkali oxides. The viscosity of iron alkali silicate melts decreased with increasing the Fe^{2+}/Fe^{3+} ratio, supporting that Fe^{2+} acts as a network modifier while Fe^{3+} works in part as a network former.

[1] D. B. Dingwell (1991), *American Mineralogist* 76, 1560-1562.