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Alkalis partitioning between miscible liquids: Experimental investigation and implications for magmas mixing/contamination

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Natural magmatic melts show wide variations in silica and the effect of SiO2 on the chemical properties of silicate melts is therefore of special interest. Model silicate melts (Di-An eutectic modified with variable amounts of silica and Ca2Si3O8 modified with variable amounts of alumina) were experimentally saturated with Na, K and Rb at a total pressure of 1 atm and temperatures of 1300–1470° C [1, 2]. A crucible supported loop technique was applied [3]. Either binary Na2O-SiO2 and K2O-SiO2 or complex Na2O-K2O-SiO2 and Na2O-K2O-Rb2O-SiO2 melts were used as alkalis sources.

It was shown that alumina content in many cases has little influence on the degree of silicate melt saturation with alkalis. In contrast, silica content strongly affects the solubility of alkalis in silicate melts. Model calculations showed that the perfectly mobile behavior of alkalis leads to a potassium specifics in basalts contaminated by crustal materials and, correspondingly, a sodic specifics in silicic melts from crustal xenoliths contaminated by the enclosing basaltic melt.

[1] Borisov (2008) Petrology, 16, 552-564.
[2] Borisov Petrology, submitted.
[3] Borisov et al. (2006) American Mineralogist, 91, 762-771.