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Mineral-buffered fluid compositions in K_2O-Al_2O_3-SiO_2-H_2O to 2.0 GPa and 800 ^{o}C as measured by the diamond-trap method.

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Mineral solubility in water at increased pressure (P) and temperature (T) conditions occurring within the Earth governs the composition and geochemical capacities of such fluids to transport material.

We have measured mineral solubilities in the system K_2O-Al_2O_3-SiO_2-H_2O (KASH) using the diamond trap technique (e.g. Kessel et al. 2004, Am. Mineral.). In this 4-component system, three minerals are necessary to fix the composition of a coexisting fluid at a given *PT*. We have determined fluid compositions coexisting with the assemblages orthoclase-muscovite-quartz-water and orthoclase-Al_2SiO_5-quartz-water from 0.5 to 2.0 GPa and 600 to 800 ˚C. Mixtures of synthetic minerals and H_2O were equilibrated at the desired P, T conditions using a 'rocking' piston cylinder apparatus. Post-quench analysis of frozen fluids trapped in the diamond layer was made by LA-ICP-MS using an incompatible trace element as internal standard.

Fluids analyzed were found to be peralkaline (K_2O/Al_2O_3 up to 4, by mole). This peralkalinity seems to be independent of pressure, whereas increasing temperature drives fluid compositions towards K_2O/Al_2O_3 near 1. A strong pressure-dependence is observed for SiO_2, such that fluid compositions at lower pressure are more SiO_2-rich (on an anhydrous basis). Theoretical consideration of our measured KASH fluid compositions indicates that the solute speciation involves aqueous complexes that were previously not known to exist in crustal fluids.