ALKALI-RATIOS IN ARC-REGIONS: EVIDENCES FROM PHENGITE-FLUID PARTITIONING EXPERIMENTS

MELZER, S., WUNDER, B. GeoForschungsZentrum Potsdam, Germany

The LIL-elements K, Rb and Cs are suggested as important geochemical tracers. Relative element ratios of the alkalis may serve as indicators for fluid-rock ratios in metasomatic processes. Thereby, OH-bearing minerals, such as phengites, act as source or sink for free water. Because Rb and Cs may replace K, this may significantly fractionate the LIL-elements between fluid and rock. For an exact quantitative understanding of K-Rb-Cs variations, it is a prerequisite to determine the partitioning of these elements between phengites and aqueous solutions. Therefore, exchange experiments were performed between aqueous chloride solutions and phengite. Derived Rb-K exchange coefficients for phengite-fluid slightly increase from 1.6 at 2 GPa to 1.8 at 4 GPa. For Cs-K-exchange lower exchange coefficients of 0.2 at 2 GPa and 0.4 at 4 GPa were found. These results show that Rb fractionates into phengite, whereas Cs preferentially partitions into the fluid. This demonstrates the contrasting fractionation behaviour of Cs and Rb between phengites and coexisting fluids.The results help to explain the alkali budget of fluids during dehydration and hydration processes. The formation or breakdown of micas during metamorphic processes will alter the K-Rb-Cs ratios of rocks and fluids. First fluids produced during subduction processes due to the dehydration of micas may show relatively high Cs/Rb-ratios according to the derived exchange coefficient at higher pressures. During an ongoing dehydration process, within an open system, the Cs/Rb-ratio of fluid will then continuously decrease until phengite is completely used up. Such a Cs/Rb-variation is exactly observed in arc-regions.