DISCUSSION

ON THE SOLUBILITY OF ALBITE IN SUPERCRITICAL WATER IN THE RANGE 400 TO 600°C AND 750 TO 3500 BARS*

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Enormous advances have been made over the past decade in our knowledge of the feldspars and their behavior in a broad range of environments. These advances have been won through countless carefully controlled moderate- and high-temperature laboratory experiments and the coupling of the results of these experiments with field observations.

A study on the solubility of albite in supercritical water, the results of which have important implications in alkali metasomatism and hydrothermal rock alteration, was recently published in this journal (Currie, 1968).

Currie, on page 330, discusses the relative solubilities of sodium and potassium from his starting material: "The soda to potash ratio on the other hand is always less in the solutions than in the starting material. It varies from 60 in the starting material down to 30 in some of the solutions". Where the figure of 60 as the soda-to-potash ratio in the starting material comes from eludes me. From the analysis, table 1, the Na_2O to K_2O ratio is 35.7, or if one prefers, the Na to K ratio is about 31. Furthermore, and contrary to Currie's statement, in all but seven of his 52 runs listed in table 3A, the Na to K ratio of the solutions is higher than that of the starting material. In fact, in half the runs it is more than double, and in some of the nonequilibrium runs given in table 3B, it is infinitely large.

Later, Currie (1968, p. 331) states: "The low values of potash in these solutions probably indicate complete leaching of potash from the starting material". This clearly cannot be. The charges used by Currie weighed approximately 120 g (p. 325) and contained 0.32 percent K_2O (table 1). About one liter of solution was collected from each run (p. 322). Should all potassium have been leached from the charges, the solutions should have contained more than 300 ppm K, a figure 50 to 1000 times greater than the concentrations actually found (tables 3A, 3B). Analyses of the leached charge *after* each run would have added much to Currie's study.

Currie's geological conclusions based on his experiments and the implications of these conclusions for metasomatic processes are open to challenge. On page 340, Currie states that "at the lower end of the P/T range covered, the solutions will be relatively soda and alumina rich", yet his figure 6 shows this proposed relationship to be erratic.

Currie goes on to say (p. 340) that "veins in low grade rocks should be comparatively Na rich and quartz poor, while at higher grades they

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** Present address: Department of Mineral Sciences, Smithsonian Institution, Washington, D. C. 20560 should contain free quartz". In the case of pelites, the commonest metamorphic rocks, this is not true. Veins in low-grade pelites (greenschist facies) are characteristically quartz-rich. Abundance of milky or gray "bull quartz" veins are distinctive features of such terranes around the world. Veins in high-grade pelites (amphibolite facies), on the other hand, are characteristically granitic or pegmatitic and are markedly enriched in Na and Al relative to their counterparts in the low-grade rocks. Finally, Currie states (p. 340) that: "Conversely the (depleted) host rocks should be relatively rich in silica at low grades and become relatively richer in alkalis at higher grades. To a first approximation this is an accurate description of many metamorphic complexes". Again, in the case of the dominant pelites, this is not true. Shaw (1956, p. 929) has elegantly shown that progressive regional metamorphism of these rocks is "accompanied by no bulk changes in composition, beyond the partial loss of water and carbon dioxide and a slight loss in oxygen caused by the change in the oxidation state of iron".

Obscure presentation of data and editorial lapses further mar Currie's paper. The concentrations of SiO_2 in the solutions listed in table 4A are presumably taken from table 3A, yet 14 of the 44 values do not correspond. Presentation of the solubility data for aluminum and sodium as parts per million of oxide and element, respectively (tables 3A, 4B, and 4C; figs. 3, 4), conveys the impression that in every run the aluminum in albite is more soluble than the sodium. Recalculating Al_2O_3 to Al, however, shows that the reverse is true in 59 of the 62 runs made by Currie and listed in tables 3A and 3B. Finally, the choice of "specific volume of water in cubic centimeters per gram" rather than pressure as the ordinate substantially reduces the geologic utility of figures 3 through 5.

REFERENCES

Currie, K. L., 1968. On the solubility of albite in supercritical water in the range 400 to 600°C and 750 to 3500 bars: Am. Jour. Sci., v. 266, p. 321-341.

Shaw, D. M., 1956, Geochemistry of pelitic rocks, Pt. 3: Major elements and general geochemistry: Geol. Soc. America Bull., v. 67, p. 919-934.