Geophysical Research Abstracts, Vol. 7, 02803, 2005
SRef-ID: 1607-7962/gra/EGU05-A-02803


# The significance of hematite precipitates in alkali feldspars in granitic rocks

A. Putnis (1), R. Hinrichs (1,2), U.Golla-Schindler (1), C.V. Putnis (1)

(1) Institut für Mineralogie, University of Münster, Germany, (2) Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil

When a mineral or mineral assemblage is out of equilibrium with a pervasive fluid phase, reequilibration may take place by a coupled dissolution-reprecipitation reaction which results in the replacement of one mineral by another. A particularly common phenomenon is the replacement of plagioclase by alkali feldspar due to contact with K,Na-bearing fluids at sub-solidus temperatures. The replacement process is initiated at the original plagioclase interface and the replacement front moves into the parent crystal exchanging all the ions, as well as the Al,Si and $^{18}O/^{16}O$ ratios. The general features of this mechanism have been recognised for many years [1,2] and have been demonstrated to be fast on an experimental time scale. A common observation in such reequilibration processes in granitic rocks is the concommitant breakdown and replacement of biotite and hornblende. This releases Fe to the fluid phase. Optical petrography indicates that the alkali feldspars are full of inclusions which produce a pronounced pink-red coloration, typical in many granites [3]. Transmission and Scanning electron microscopy (TEM and SEM) and Electron Energy loss spectroscopy (EELS) study of alkali feldspars replacing plagioclase in such rocks shows that the reddening is due to sub-micron size hematite precipitates. These form directly at the replacement front between the parent plagioclase and the product alkali feldspar. We suggest that the precipitation of hematite at the interface is a direct consequence of the plagioclase-fluid interaction. The precipitation of hematite may result from a local increase in pH at the interface where $H^+$ is involved in the dissolution process. The commonplace observation of cloudy red alkali feldspars in granites leads us to the conclusion that such granites are secondary, sub-solidus replacement products of parent rocks with a different mineralogy.

[1] Orville P.M. (1972) Plagioclase cation exchange equilibria with aqueous chloride

solution: results at 700°C and 2000 bars in the presence of quartz. Am. J. Sci. 272, 234-272

[2] O'Neil J.R. (1977) Stable isotopes in mineralogy. Phys. Chem. Minerals 2, 105-123

[3] Boone G.M. (1969) Origin of clouded red feldspars: petrologic contrasts in a granitic porphyry intrusion. Am.J. Sci. 267, 633-668