Geophysical Research Abstracts, Vol. 7, 00904, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00904

The role of fluid chemistry in brittle failure and breccia formation during synmetamorphic fluid flow and shear zone formation: an example from the Curnamona Province, Australia

C Clark (1), A. Schmidt Mumm (1) and K. Faure (2)

(1) School of Earth and Environmental Sciences, University of Adelaide, Australia, (2) Institute of Geological and Nuclear Sciences, New Zealand

The development of shear zones at mid-crustal levels in the Proterozoic Willyama Supergroup in southeast central Australia was synchronous with widespread fluid flow resulting in albitisation and calcsilicate alteration. Monazite dating of shear zone fabrics indicate that they formed at 1582 $\pm$ 22 Ma, at the end of the Olarian deformational event and immediately prior to the emplacement of regional S-type granitoids. Two chemically distinct stages of fluid flow are identified in the area: firstly an albitising event which involved the addition of Na and loss of Si, K and Fe; and a second phase of calcsilicate alteration with additions of Ca, Fe, Mg and Si and removal of Na. The sources of these fluids can be directly related to the devolatilisation of the Willyama Supergroup at depth. Fluid fluxes calculated for albitisation and calcsilicate alteration were 5.56 x 10^9 to 1.02 x 10^{10} mol m^{-2} and 2.57 x 10^8- 5.20 x 10^9 mol m^{-2} respectively. The switch in fluid chemistry and the resulting decrease in fluid flux can be directly linked to the change in alteration products from relatively fine-grained albite, which can enhance fluid flow via the process of fluid assisted grain boundary diffusion, to the growth of coarse-grained actinolite. The growth of coarse-grained actinolite in effect reduces the surface area available for fluid-rock interaction thereby decreasing fluid permeability, diffusion rates and reaction kinetics. A consequence of the decrease in permeability was the development of fluid overpressure which resulted in the formation of breccias. Fluid pressure fluctuations of $\sim$80 MPa during the brecciation process have been quantified by structurally constrained microthermometric analysis of syn-tectonic fluid inclusions coupled with metamorphic character of the

area.