Geophysical Research Abstracts, Vol. 7, 09741, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09741

The composition of melt during crustal anatexis from the analysis of silicate glass within extruded migmatitic enclaves in el Hoyazo dacites, SE Spain

A. Acosta-Vigil (1), B. Cesare (1,2), D. London (3) and G. B. Morgan VI (3)

(1) Istituto di Geoscienze e Georisorse, Consiglio Nazionale delle Ricerche, Padova, Italy, (2) Dipartimento di Mineralogia e Petrologia, Università di Padova, Padova, Italy, (3) School of Geology and Geophysics, University of Oklahoma, Norman OK, USA (acosta@dmp.unipd.it / Fax: 39-049-8272010 / Phone: 39-049-8272032)

It is well known that the anatexis of most metasediments (e.g. metapelites, metagreywackes) produces granitic melts. The precise chemistry of such liquids, however, is not well constrained in natural ocurrences (e.g. anatectic leucosomes) and is difficult to determine in experiments, because EMPA of experimental glasses usually contain large and uncorrected systematic errors caused by beam damage during analysis. Information about mechanisms and kinetics of partial melting is very limited also: how homogeneous is the melt at the onset of anatexis, how does the melt composition evolve with time in different textural domains, the time required for liquids to homogenize throughout the entire protolith, and how the latter timeframe compare with those reported in the literature for segregation and extraction of melt from restite. To provide some answers to these questions we have started a research program that combines experiments with detailed petrologic work on natural and unusual samples. The experiments consist of the dissolution of a suite of mineral phases into haplogranite melt, and the partial melting of rock cylinders cored from leucogranites, metapelites, and metagreywackes. The results have revealed so far that melting around the eutectic produces liquids homogeneous in composition in the different textural domains, whereas melting at temperatures much higher ($\geq 100^{o}$C) than the eutectic produces liquids with heterogeneous Al/Si ratios but approximately homogeneous ASI and Na/K ratios throughtout the entire protolith. The results have revealed also the diffusive transport properties of H_2O-saturated simple granitic melts, with applications for calculating timeframes for melting and melt homogenization under H_2O-

saturated conditions. The study of natural samples consists of the analysis of silicate glass included in minerals and in the matrix of already well characterized HT/MP-to-LP metasedimentary enclaves within El Hoyazo dacites, in the Neogene volcanic province of SE Spain. The glass represents former silicate melt produced during partial melting of the enclaves at c. 800-850^{o}C and 5-7 kbar, and quenched upon rapid ascent and extrusion. EMP analyses conducted in five different enclaves indicate that the glass is always granitic, approximately homogenous, with high SiO_2 (71-75 wt %) and K_2O (4.0-5.5 wt %), low FeO_t (1.0-1.7 wt %), MgO (0.0-0.2 wt %), CaO (0.1-1.0 wt %), and H_2O ($\approx$ 0-5 wt %, calculated by difference), and moderate to high ASI (1.10-1.35). The glass in each textural position, however, presents a particular chemical signature independently of the host enclave, being more evolved in the order: Ilm $<$ matrix $<$ Grt $<$ Pl. Preliminary analysis points toward the hypothesis that these differences may reflect the evolution of melt composition during the progressive partial melting of the enclaves, in accordance with petrographic observations indicating that plagioclase is one of the earliest phases to crystallize whereas ilmenite is one of the latest. Post-entrapment modification of the liquid/glass, however, might have played also a role in the compositional variability of glass.