Geophysical Research Abstracts
Vol. 12, EGU2010-6877-1, 2010
EGU General Assembly 2010

Highly non-correlated trace element patterns in crystals formed from mixed magmas

Ewa Słaby (1), Michał Śmigielski (2), and Andrzej Domonik (3)

(1) Institute of Geological Sciences, Polish Academy of Sciences, Research Centre in Warsaw, (e.slaby@twarda.pan.pl), (2) Institute of Geology, University of Warsaw, Żwirki i Wigury 93, 02-089 Warsaw, Poland, (3) Institute of Hydrogeology and Engineering Geology, University of Warsaw, Żwirki i Wigury 93, 02-089 Warsaw, Poland

It is commonly believed that if mixing is the only process occurring in a system, linear correlations must be observed between concentrations of any two chosen elements. Consequently the mixing equation is a linear equation combining the composition of the hybrid, the two end-member magmas and the degree of the process progress (Fourcade and Allegre, 1981; Langmuir et al., 1978). Mixing is well registered in mineral domains grown from regions in which magmas mix intimately. Consequently such domains (recognized in feldspars) have been selected for the present research work. Their chemical heterogeneity was determined with use of LA ICP MS. The observed variation in compatible elements concentration with depth, for a single spot, have been taken as a base for two mathematical models of the elements mobility. The aim of the models was to determine, to what extent the relationship between two elements incorporated into the crystal issimilar , opposite or random. The models fully corroborate experimental results by Perugini et al. (2008) The models show that in the crystal domains the relationships between concentrations of two elements of different mobility does not follow the schema, which could be expected for mixing of two end-member magmas. Due to intensive stirring, the magma domains chaotically advected to the crystal result in slightly different composition of crystallizing phase. The differences are the consequence of different element mobility during mixing and different elements exchange rate between mixed domains. If the diffusion progresses with different speed for every one of them, linear correlations cannot be observed between concentrations of the two elements chosen for analysis in the active domains. Consequently, because the active domains feed the growing crystal the differences are reflected in its composition. The models are complementary and give possibility to assess the degree of the elements exchange between both magmas e.g. the degree of magma blending. The models also allow to estimate easily the deviation from the linearity of the behavior of the elements at different stages of mixing.

Fourcade, S. and Allegre, C.J., 1981. Trace element behavior in granite genesis: a case study. The calc-alkaline plutonic association from Querigut complex (Pyrenees, France). Contributions to Mineralogy and Petrology, 76: 177-195.
Langmuir, C., Vocke, R.D.J., Hanson, G.M. and Hart, S.R., 1978. A general mixing equation with application to the Icelandic Basalts. Earth and Planetary Science Letters, 37: 380–392.
Perugini, D., De Campos, C.P., Dingwell, D.B., Petrelli, M. and Poli, D., 2008. Trace element mobility during magma mixing: Preliminary experimental results. Chemical Geology, 256: 146-157.