# Crystal geochemical heterogeneities produced by mixing processes – probabilistic model of accordance between distributions of different elements

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The crystallization history of a mineral produced by mixing processes is typically revealed by its zoned trace-element distribution pattern. A three-dimensional depiction of such a trace element distribution in a cross-cut of single mineral, which was formed during intensive stirring of two magmas of contrasting composition, shows a complex pattern of domains variably enriched and impoverished in some elements. The observed variation in compatible elements concentration within feldspar in-depth profile has been taken as a base for models of the elements mobility (Słaby et al., 2010). The domains chemical heterogeneity was determined with use of LA ICP MS. The probabilistic approach allows introducing LA ICP MS measurements error into the model. In the approach for the concentration data of some elements the probability of four possible variations occurring between any two of the elements was calculated: 1) both of them being relatively increased; 2) both reduced; 3) element A increased and B reduced; 4) element A reduced and B increased in comparison to their normalized value. Elements of contrasting behavior in both magmas have been chosen for the model. Consequently the model permitted differentiation between compositionally variable magma domains advected to crystallized mineral: coherent (mafic and felsic) and active (enriched in mafic or in felsic components). Resorption zones showing chemical disequilibrium with decoupled compatible and incompatible elements relationship have been identified. The probabilistic model gives insight into the style of granitic magma chamber replenishment. It verifies the pluton crystallization model (Słaby and Martin, 2008) proving that the replenishment schema was more complicated than this predicted from the whole rock composition data.

Słaby, E., Martin, H., (2008) Mafic and felsic magma interactions in granites: the Karkonosze Hercynian pluton (Sudetes, Bohemian Massif). Journal of Petrology 49, 353-391.
Słaby, E., Śmigielski, M., Śmigielski, T., Domonik, A., Simon, K., Kronz, A. 2010. Chaotic three-dimensional distribution of Ba, Rb and Sr in feldspar megacrysts grown in an open magmatic system. Contribution to Mineralogy and Petrology (submitted).