Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07582, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07582
EGU General Assembly 2008

Spinodal decomposition in ternary feldspar.

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Phase separation in a three-component feldspar system is considered theoretically. The separation occurs by virtue of a spinodal mechanism and corresponds to a non-linear uphill diffusion. The latter is described in terms of the generalized chemical potential that depends on components concentrations and concentration gradient and therefore implicitly depends on coordinates. The chemical potential evolves to a uniform constant as the system evolves to an equilibrium state. The region of unstable concentrations is found numerically on the ternary phase diagram together with the final characteristics of the decomposing phases. Realistic regions of temperatures and pressures are considered having in mind specific geologic applications. Decomposition dynamics is described by corresponding multi-component generalization of the original equation of Cahn and Hilliard. A possible intrinsic anisotropy of the system is taken into account by considering anisotropic terms accounting for the gradient energy contribution, the latter thus accounts for the formation of elongated lamellae. The resulting set of equations is solved numerically using finite elements routine. Obtained results show a pronouncedly elongated shape of the precipitates of the exsolved phase and are in a good qualitative correspondence with the actually observed patterns.