

変成岩の反応縁にみられる組成勾配の成因 Origin of compositional gradient recorded in metamorphic reaction rims

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Localized occurrence of product minerals in reaction rims strongly suggests that the formation of the rim has been rate-controlled by diffusion. It has been a general consensus that the disequilibrium state during the rim formation was quenched, and that the chemical potential gradients were preserved in the rims, which was recognized as presence of compositional gradients of product minerals. This study propose alternative model to explain the compositional gradient occurring in the metamorphic coronas. In retrograde stages, migration distance (mean free path) decreases with descending temperature. The metamorphic reaction would cease when the migration distance sinks below the spatial distance between the reactant minerals. Each of reactant minerals that are chemically isolated could attain the local equilibrium. That is, the diffusion profiles maintained during the reaction would modify to homogenize after the reaction ceased. The continuous reaction produces the product minerals that change their composition progressively during descending temperature. Migration of components within crystal is much slower than that along grain boundary by a factor of 5 to 6. This suggests that compositional heterogeneity in product minerals would be likely to preserve even if local equilibrium was maintained among minerals within the migration distance.

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