

Segregation and deformation of viscous fluids and migmatite texture

Kazuhiro Miyazaki[1]

[1] GSJ/AIST

Heat and material transport by melt migration in low to middle crust plays crucial role for evolution of the continental crust. However, viscosity of felsic melt is very large and buoyancy-driven segregation and migration of felsic melt can not explain high flux rate of melt migration for formation of high-T metamorphic complex at low to middle crustal levels. Pervasive melt migration associated with deformation within partial melted metamorphic complex is a possible mechanism to enhance the velocity of melt migration. Segregation of melt to crack from partial melted rock should take place by deformation. Here, I modeled textural evolution of such system by assuming simple phase separation and deformation.

Model system is composed of two types of particles. One type of particles is less viscous and the other is viscous. The viscous type of particles has tendency to coagulation, where the nature of coagulation is introduced by attractive force between the viscous particles. Two types particles are mixed homogeneously at initial condition. Mixture of particles is sandwiched between two solid plates. Simple shear deformation is applied to the system by two plates moving to opposite directions. After the deformation, less viscous particles precipitate along moving plate (so called viscous segregation). Before complete viscous segregation, banding structure consisting of less viscous particle layers and viscous particles layers are formed. The banding structure has slightly oblique direction to shear direction. During formation of banding structure, dispersion of speed of less viscous particles is larger than that of viscous particles, and average pressure of less viscous particles is lower than that of viscous particles. These suggest that less viscous particles move passively with deformation of viscous particles.

Although model presented here is very simple, only assuming attractive force between viscous particles and simple shear, produced patterns resemble complex textures of migmatites distributed widely in lower part of high-T metamorphic complexes.