Deformation of feldspar and transportation mechanism of water during shearing: implications for active microscale processes

Abstract:

Feldspars are a major constituent of crustal rocks, and they often form the load-bearing framework of such rocks. Consequently, the flow of crustal rocks is often governed by the mechanisms of feldspar deformation. An additional factor controlling the rheology of crustal rocks is grain-size reduction of feldspars. This reduction is governed by fragmentation, dynamic recrystallization, and neocrystallization such as dissolution-precipitation and myrmekite-forming reaction. Fluid water is assumed to play key roles on deformation mechanisms including these grain-size reduction processes. Yet its distribution around feldspars in granite mylonites, and the ways in which it is transported and contributes to deformation mechanisms in natural systems, is poorly understood; consequently, there exists a need for additional detailed observations.

In this presentation, I focus on K-feldspars, a major constituent in the upper-middle crust. First, I focus on the deformation mechanisms of K-feldspars, using high-resolution SEM and EBSD analysis. After characterizing the deformation mechanisms, I will show the IR-mapping results, and discuss transportation and roles of fluid water during grain-size reduction of K-feldspars. Also, I evaluated the diffusivity of water at intergranular regions of rocks, and try to discuss implications for changes in rock strength by water transportation in rocks.