

## Misconstrues related to grain size reduction and exsolution/phase separation in plagioclase under lower crustal conditions

\*Taku Matsuda<sup>1</sup>, Yusuke Soda<sup>1</sup>, Yumiko Harigane<sup>2</sup>, Takamoto Okudaira<sup>1</sup>

1. Osaka City University, 2. Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology (AIST)

Understanding the development of shear zones in the uppermost region of the lower crust is a key factor to evaluate recurrence of major earthquakes. Plagioclase is a major constituent mineral of the lower crustal shear zones, and then mechanical and rheological properties of plagioclase aggregates is crucial. When plagioclase is very fine (less than tens of microns), it would deform by grain-size-sensitive (GSS) creep, leading strain softening. The processes of grain size reduction of plagioclase in the lower crust, involving dynamic recrystallization, fracturing, metamorphic recrystallization, and phase transition, have been reported. Recently, exsolution/phase separation has been proposed as a new process of grain size reduction of plagioclase. In this study, to clarify the dominant process of grain size reduction of plagioclase in the lower crustal conditions, we analyzed anorthositic mylonites from Eidsfjord shear zone in northern Norway. The observation of the microstructure and the crystal orientation obtained from SEM-EBSD revealed that dynamic recrystallization and fracturing are not important as the process of grain size reduction of plagioclase. In the recrystallized plagioclase grains, An-poor cores and An-rich rims are observed. The boundary between core and rim in each grain is sharp and the crystallographic orientation between them is not different to each other. There is a gap between the composition range of An-poor cores and the composition of An-rich rims. Compositions of plagioclase porphyroclasts are similar to those of rims of recrystallized grains, suggesting that compositional zonal structures observed in recrystallized grains may not be resulted from fracturing of plagioclase porphyroclasts and subsequent metamorphic overgrowth of rims. These observations imply that the compositional zonal structures of fine-grained plagioclase may be the result of grain size reduction due to exsolution/phase separation.

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