

Ultra-fine textures along grain boundaries in nominally fresh mantle xenoliths

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It is important for the evolution of the Earth to understand the role of grain boundaries during melts/fluids migrations in mantle peridotites. There are, however, very limited numbers of studies on grain boundaries in natural samples, although many experimental and theoretical approaches have been carried out (e.g., Drury and Fitz Gerald, *Geophys. Res. Lett.*, 1996; Hiraga et al., *Nature*, 2004).

We focus on nanoscale microstructures of crystal surface (grain boundary) in “ nominally fresh ” peridotite xenoliths from the San Carlos, USA, which is one of the most famous localities of peridotite xenolith in the world. Thin amorphous films along grain boundaries were already reported in some San Carlos xenoliths (Wirth, *Contrib. Mineral. Petrol.*, 1996).

We recovered mineral grains with a selfFrag at the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in order to minimize mechanical damages during mineral separations. We observed multiple grains of peridotite xenoliths using a high-resolution electron microscope (FE-SEM) at JAMSTEC.

Microstructures of crystal surface of these peridotite xenoliths are classified as follows. (1) over micron scale structures such as moth-eaten structures, vermicular structures, automorphic crystals and etch pits. (2) submicron scale structures. It is interesting to note that (2) submicron scale structures are frequently observed on (1) over micron scale structures. These textures suggest that microstructures were developed by several stages. We analysed on the surface of these textures using a micro-Raman and SEM-EDS techniques. We are also planning to perform transmission electron microscope, combined with chemical analyses in order to identify the surface materials that constrain P-T conditions and fluids for the formation of these textures.

Keywords: peridotite xenolith, Microstructures, TEM, grain boundary, fluids