Study of microstructure of kelyphite after garnet by means of EBSD- part 2

Masaaki Obata[1]; Kazuhito Ozawa[2]

[1] Earth and Planetary Sci., Kyoto Univ; [2] Univ. Tokyo, EPS

Kelyphite is an extremely fine-grained, fibrous sympectitic intergrowth of spinel, Cpx and Opx, typically developed as a rim surrounding garnet crystals. It has generally been considered from its textural relationship and mineralogical assemblages to be a breakdown product of garnet. The fine-grained part is typically surrounded by a coarse rim of Opx (COR) adjacent to olivine. Kelyphite consists of many domains of single crystal of Opx, which may be called the cells. The Opx cell internally contains several small domains of Cpx and both pyroxenes further contain numerous fibrous spinels. It was found out by the use of FE-SEM and EBSD that Opx and Cpx shear their (100), (010), and [001]. Two kinds of cell may be recognized according to the topotaxic relationships between the spinel and the pyroxenes. (1) topotaxic cell, in which one of spinel $\{111\}$ coincides with the pyroxene (100) and one of spinel $\{110\}$ coincides with the pyroxene (010); (2) non-topotaxic cell, in which topotaxic relationship is incomplete or non. The COR-Opx is crystallographycally continuous to the adjacent kelyphite-cell Opx, and therefore it may be regarded as a part of the kelyphite cell. Kelyphite that formed at relatively high-temperatures (e.g., Czech Mohelno garnet peridotite, Medaris et al, 1990) contains topotaxic cells; whereas those of lower-temperature origin, such as from W. Norway (Spengler. et al, 2006) dominantly consists of non-topotaxic cells. The spinel-pyroxene symplectite from the Horoman peridotite (e.g. Odashima et al, 2004) is regarded to be a topotaxic cell that was formed after garnet at high temperatures (above 1000 degree C). The topotaxic relationship may be established when spinel nucreated at the initial stage of the kelyphite formation and the initial relationshitp is maintained during subsequent cell growth defining the cell types. It is considered that relatively high-temperature kelyphitization tends to prodece topotaxic cells; while lower-temperature kelyphitization will produce more non-topotaxic cells, probably because of a large degree of oversaturation. These topotaxic rlationships in the kelyphite cells may be understood in terms of the concept of oxygen-closest packing, which provides with a theoretical basis for the oxygen-fixed reference frame (Obata et al, this volume).