Occurrences of orthopyroxene in multi-textured layered gabbros from the Hess Deep Rift, East Pacific Rise

TAKASHI HOSHIDE, SUMIAKI MACHI, JINICHIRO MAEDA [123]

[1] Akita University, hoshide@gipc.akita-u.ac.jp
[2] Tohoku University
[3] Hokkaido University

IODP Exp.345 drilled three main holes (Holes U1415 I, J & P) from the lowermost plutonic crust exposed at the Hess Deep Rift, East Pacific Rise and primitive layered gabbroic rocks were newly discovered from these holes (Gillis et al., 2014). One of the mysteries about the layered gabbros is the fact that Opx, which is considered to appear in the late stage of crystallization on the basis of crystallization experiments of MORB, occurs as a dominant phase in many of the layered gabbros. In this presentation, we report the occurrence of Opx from the Hole U1415P and consider the significance of Opx in the origin of the layered gabbros.

Hole U1415P (about 100m in thickness) is divided into two units, the upper Multi-textured Layered Gabbro Series and lower Troctolite Series (TS). Gabbroic rocks from the MLGS contain Opx (< 4vol%) and are macroscopically classified into Opx-bearing olivine gabbro. However, these rocks are mesoscopically (on cm scale) inhomogeneous and have a great variation of mode, grain size and texture. On the other hand, TS consists of homogeneous troctolites and Opx rarely occurs in the series.

The occurrences of Opx from the MLGS are as follows: (i) coarse-grained Opx+Cpx+Pl vein parallel to the layered structure of the surrounding troctolite (ii) undeformed Opx+Pl veinlets in kinked Ol (iii) Opx in the concave of anhedral Ol (iv) Opx rimming Cr-spl crystals in contact with Ol. The occurrence of Opx like (ii) and (iii) resembles the texture which is considered to be formed by the reaction between mantle peridotite and a SiO_2-saturated melt (e.g, Piccardo et al., 2007). The fact that Opx is often found in association with Cr-spl suggests that the SiO_2-saturated melt which reacted with Ol was rich in chromium. In addition, Cr-spl crystals rimmed by Opx contain Opx-bearing multiphase (polymineralic) solid inclusions. Similar inclusions have been reported from layered intrusions, ophiolites and plutonic rocks in mid-ocean ridges, but the inclusions from the MLGS do not typically contain amphibole. The inclusions should be key in understanding the chemical composition of the reacted melt.