Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SIT05-07 Room:104 Time:May 21 11:00-11:15

High-Ti picrite from the Lalibella area, Ethiopian LIP

Akira Ishiwatari[1*], Dereje Ayalew[2], Minyahl Teferi Desta[1]

[1]CNEAS, Tohoku University, [2]Addis Ababa University, Ethiopia

Through the one million years of time span around 30 Ma in Oligocene, a vast extent of flood basalt lavas erupted in the Ethiopian plateau with regional uplift. Some rhyolite lavas and pyroclastic flows erupted and large basaltic shield volcanoes formed in the later stage, and the Ethiopian LIP was completed. From Miocene to the present, the volcanism is restricted in the narrow rift zones and the Afar triangle where continental rifting is taking place. The flood basalts to the west of the rift zone are divided into two series; western (inland) low-Ti series and eastern (near rift) high-Ti series, though they are simultaneously formed. Picrite is rare in this LIP (Beccaluva et al. 2009; J. Petrol.; Rogers et al. 2010; EPSL), but is found along the Dilb Road section of the Lalibela area as some lava flows alternated with the high-Ti basalt lavas. The Lalibela Ethiopian Orthodox (Copt) Church that is registered as a world heritage site is an in-situ carving of a picrite lava. Picrite is an important target of igneous petrology as the most primitive mantle-origin magma or its olivine accumulation. We analyzed 3 picrite samples that are collected in the Lalibela area. Olivine phenocrysts are Fo77.7-88.4 and the Mg-rich crystals contain 0.3-0.4 wt% NiO. Clinopyroxene phenocrysts are Mg#72-88 and contain 0.8-2.9 wt% TiO2. Spinel inclusions and microphenocrysts are Cr#79-84, Mg#18-51, Fe3+#11-26, and contain 3.6-7.0 wt% TiO2. Plagioclase is around An60. Ilmenite also occurs. Maximum Fo value of olivine (88-89) indicates a primitive nature of the magma that can coexist with mantle peridotite. Most characteristic feature of the mineral chemistry is the high Cr# of spinel (>80). The Sorachi-Yezo picrite (Ichiyama et al. 2012; Geology) bears spinels with Cr#44-67, and the Mino-Tamba picrite/basalt (Ichiyama et al. 2006; Lithos; Koizumi and Ishiwatari, 2006; Isl. Arc) also bears spinels with Cr#58-67. These picrites are thought to be originated in oceanic LIPs. It is well known that continental layered intrusions that originated in continental LIPs bear high Cr# spinels. Although high-Ti series magmas occur in both oceanic and continental LIPs, the high Cr# spinels of the Ethiopian picrites indicate their continental signature, and give suggestions for the origin of the subcontinental mantle.

Keywords: picrite, flood basalt, high-Cr spinel, subcontinental mantle, continental rifting, oceanic crust formation