

PGE abundances and Os isotope ratios of troctolites from pacific oceanic lithosphere

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The structure of oceanic lithosphere becomes much clear in these days. Troctolite is a kind of gabbro, mainly consisting of olivine and calcic plagioclase with minor pyroxene, found in oceanic lithosphere. Melt-rock interactions at mantle-crust transition zone are believed to play a main role for troctolite formation. Troctolites are locally found at Atlantis Massif oceanic core complex, Mid Atlantic Ridge 30 iii N (Blackman et al., 2006), at Kane Megamullion, Mid Atlantic Ridge 23N (Dick et al., 2008; 2010), at Uraniwa Hills, Central Indian Ridge (Nakamura et al., 2009), and at Godzilla Megamullion, Parece Vela Basin of the Philippine Sea (Sanfilippo et al., 2013). They also occurred as sections of the oceanic lithosphere in ophiolites and show similarity to lower crust sections from slow and ultra-slow spreading ridges (e.g., Herbert et al., 1989; Sanfilippo and Tribuzio, 2013). The formation process of the troctolites is in debate. From the ophiolite studies, troctolites were formed as cumulates from primitive basalts in a closed system (Bezzi and Piccardo, 1970; 1971; Borghini and Rampone, 2007). Alternatively, troctolites were the results of a substantial amount of mantle olivine incorporated into the lower oceanic crust (Suhr et al., 2008; Drouin et al., 2009; 2010) based on the studies of oceanic core complex.

Troctolites were also found in the drilled core at site 895 of ODP Leg 147 in Hess Deep, located at a triple junction between EPR and Cocos-Nazca plate boundary. Hess Deep is a small rift with intra-rift ridges, where deep-seated rocks probably formed at EPR are exposed (Francheteau et al., 1990; 1992). Ultramafic and related rocks were expected to be found at the site in fast-spreading ridge system and sequences of dunite, harzburgite, troctolite, and gabbro were actually drilled (Allan and Dick, 1996; Dick and Natland, 1996; Arai and Matsukage, 1996). Troctolite appears to be transitional from dunite to olivine gabbro (Arai and Matsukage, 1998).

Major, trace and platinum group element (PGE) abundances and Os isotope ratios of troctolites from Holes 895C, 895D and 895E were newly measured using XRF, ICP-MS, and TIMS. The samples are clearly divided in two groups by Al₂O₃, MgO and NiO. Prichard et al. (1996) reported the PGE and trace element abundances of the ultramafic rocks from Holes 895. Their PGE concentrations of the troctolites were in a similar range to harzburgites and dunites from the same sites and Pt and Pd are enriched in some troctolites. They also found platinum-group alloys and base metals in troctolites. New data set with Os isotope ratios possibly make constraints on the forming process of troctolites under the oceanic ridge.

Keywords: troctolite, Os isotope ratio, PGE abundance, oceanic lithosphere