Hydrous melting experiments of komatiites: Investigation for the compositions of the Hadean oceanic and continental crust

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The process of the mantle-crust differentiation and the composition the oceanic and continental crust in Hadean are essential to understand the chemical mantle evolution due to the extraction and recycling of the crust. From the analyses of the Hadean zircon, the existence of liquid water and granitic-andesitic melt have been implied [1], but the process to generate such granitic-andesitic melt has been still unclear. Previous studies have suggested that the Hadean mantle would have had high mantle potential temperature (MPT), and that the oceanic crust generated at high MPT has komatiitic composition [2]. Because the hot Hadean mantle could have generated steep thermal gradient in the crust, this komatiitic oceanic crust could have experienced hydrous melting upon subduction, and generated melt which could have formed the continental crust. However, the composition of the melt generated in the hydrous melting of komatities has been undetermined.

We estimated the style of the igneous activity in Hadean and the composition of the oceanic crust, referring previous mantle convection models at high MPT [3,4]. The Hadean oceanic crust would have formed form the melt generated at small melt fraction under a thick (-200km) lithosphere before the onset of the plate-tectonics, and after the onset of the plate-tectonics, formed from the melt generated at large melt fraction under oceanic ridges. Then, the composition of the oceanic crust was estimated from high pressure and high temperature melting experiments [5]in the case before the onset of the plate-tectonics, and from calculations with pMELTS in the case after the onset of the plate-tectonics. The compositions of the melt were estimated to be komatiitic in both cases, though the MgO and FeO contents are significantly different between the two cases. We performed hydrous melting experiments of these komatiites using the piston-cylinder high pressure apparatus, with special care of the oxygen fugacity. We report the estimated compositions of the probable Hadean oceanic crust and progress of the hydrous melting experiments.

[1]Hopkins et al. (2010) *EPSL* **298**, 367-376. [2]Takahashi (1985) *Nature* **315**, 566-568. [3]Korenaga (2009) *Geophys. J. Int. 179, 154-170.* [4] Foley et al. (2014) *JGR* **119(11)**, 8538-8561. [5] Kondo et al. *Submitted.*