CHEMICAL CHARACTERISTIC OF CK CHONDRITES IN THE LIGHT OF P, REES, TH AND U .

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Introduction: Karoonda-type carbonaceous (CK) chondrites are unique among carbonaceous chondirte groups, because they consist of a series of chondrites with petrologic types 3 to 6. There is a conflicting argument; whether or not CK chondrites originated from the same parent body of CV chondrites. Based on oxygen isotopic measurements and mineralogical observations, Greenwood et al. [1] concluded that both CK and CV share a common parent body. Later, Wasson et al. [2] also came to the same conclusion from chemical and mineralogical studies. We have systematically analyzed CK chondrites for P, rare earth elements (REEs), Th and U for better understanding of the formation process of their parent body.

Samples and Experimental procedures: A total of 16 CK chondrites (one CK3, six CK4s, six CK5s, two CK6s and one each for CK4-5 and CK5-6) were analyzed. In addition, two LL5s, once classified as CK5, also were analyzed. These meteorites were all recovered on Antarctica. About 300 to 500 mg of each meteorite was ground in an agate mortar. About 30 mg of each powdered sample was used for the determination of P by inductively coupled plasma atomic emission spectrometry (ICP-AES) [3] and of REEs, Th and U by ICP mass spectrometry [4]. Besides, several other elements (Mg, Al, Ca, Ti, V, Mn and Fe) were analyzed by ICP-AES.

Results and discussion: REE abundances are generally chondritic with 1.5 to 2.5 x CI for most CKs. However, when inspected in detail, they are fractionated. There is no systematic fractionation in REEs abundances among petrologic types. REE are not correlated with P in their abundances, while there is an apparent correlation between REEs and Ca abundances, suggesting that REEs are not hosted by Ca-phosphates but are present in other Ca-rich minerals, presumably hibonite. There is systematic change in REE abundances among petrologic types; Type 6 CKs have the highest REE abundances, followed by CK5 and then by CK4. We interpret these data as follows; (i) CK chondrite parent body had an onion-shell structure, with CK6s being in the center, (ii) condensation and accretion occurred simultaneously, with CK6s being accreted earlier and more enriched in high-temperature phases, and (iii) REEs were not redistributed in the parent body. In related to (iii), the size of CK chondrite parent body was relatively small compared with those of ordinary chondrites so that the duration time at the temperature high enough for imprinting the petrologic signature of type 6 was short and REEs were not allowed to diffuse into Ca-phosphate. As no REE abundances similar to those of Allende [5] were observed in low petrologic type CKs, we incline to the idea that CK and CV had their own parent bodies.

References: [1] Greenwood R. C. et al. 2010. *Geochimica et Cosmochimica Acta* 74: 1684-1705. [2] Wasson J. T. et al. 2013. *Geochimica et Cosmochimica Acta*: 45-62. [3] Aso K. and Ebihara M. 2013. *Analytica Chimica Acta* 779: 8-13. [4] Shinotsuka K. and Ebihara M. 1997. *Analytica Chimica Acta* 338: 237-246. [5] Shinotsuka K. et al. 1995. *Metoritics* 30: 694-699. Khan R. et al. 2015. *Earth and Planetary Science Letters* 422:18-27.