

**GEOCHEMICAL STUDY OF TYPE 3 ORDINARY CHONDRITES.**

G. Hublet<sup>1,2</sup>, A. Yamaguchi<sup>2</sup>, V. Debaille<sup>1</sup>, N. Shirai<sup>3</sup>, M. Kimura<sup>2</sup>, <sup>1</sup>Laboratoire G-Time, Université Libre de Bruxelles, Brussels, Belgium, <sup>2</sup>Antarctic Meteorite Research Center, National Institute of Polar Research, Tokyo, Japan,

<sup>3</sup>Department of Chemistry, Tokyo Metropolitan University, Tokyo, Japan.

E-mail: ghublet@ulb.ac.be

**Introduction:** Chondrites are the most primitive objects in the Solar System. The study of those meteorites gives information to constrain the initial compositions, formation and evolution of the earliest objects and planetesimals in the Solar System. One of the most powerful methods used to study chondrites and achondrites is geochronological methods using long and short-lived isotopic systems. A major issue for using the information obtained with these methods is that samples must have remained undisturbed after their initial formation (i.e., in a closed-system). However, in most meteorites, secondary processes like metamorphism disturbed these isotopic systems. To evaluate the impact of such secondary processes on elemental composition, we have conducted a systematic bulk and mineral analyses of minor and trace elements in type 3 to 6 ordinary chondrites (OC). Major element will be also analyzed to obtain at the same time a large and complete elemental composition database for this type of chondrites.

For the first part of this study, we particularly focused on unequilibrated type 3 OC. Seventeen samples in the NIPR Antarctic meteorite collection were selected: seven of them are LL3 (Asuka (A) 9046; Allan Hills (ALH-) 77304; Yamato (Y-) 74660; Y-790448; Y-791558; Y-791835 and A-87319), five L3 (A-881244; A-881683; A-882102; ALH-77260 and Y-793375) and five H3 (A-882073; ALH78084; Y-980053; Y-980135 and Y-983276). The Smithsonian Institute Allende meteorite powder was also analyzed as a control sample.

In this study, we present the results obtained for the bulk composition of REE, Th, U and some trace and minor elements.

**Analytical method:** REE, minor and trace element measurement were performed on an ICP-MS Element XR at NIPR. An enriched isotope <sup>149</sup>Sm was added before the dissolution of samples to control the sample loss during the chemical preparation. The value of Sm was determined by both isotope dilution and external calibration method. Major element measurement will be also performed on ICP-AES at ULB on a different aliquot.

**Results and discussion:**

**REE, Th and U:** all the samples present a flat pattern higher than CI chondrite. The range of this enrichment is larger for the LL3 sample (1.1 to 1.8x to CI). Both L3 and H3 are within the range of LL3 (L3: 1.3 to 1.7x CI; H3 1.2 to 1.6x CI). These results are consistent with the values of OC from the previous studies [1,2].

**Minor and trace element:** all OC analyzed in this study presented an enrichment in minor and trace element compared to CI. These samples have higher Nb/Ta and Zr/Hf ratios compared to those of CI chondrite. These two positive anomalies are more important for the LL3 compared to L3 and H3. Lead is depleted in these types of OC.

**Volatile element:** We also analyzed some volatile elements (Zn, Cu, Ga, Cs and Pb). Most of them are largely depleted compared to CI. This depletion has almost the same amplitude in the three types of UOC. Among the five elements, Zn and Pb are highly depleted. There are large variation of Cs contents, especially for the LL3 and L3 compared to H3. These results are consistent with previous studies [3-5].

These preliminary results obtained on OC samples from LL3, L3 and H3 show no significant variation for bulk minor and trace elemental composition.

**References:**

[1] Nakamura N. (1974), *Geochim. Cosmochim. Acta* 38: 757-775, [2] Evensen N. M. et al., (1978) *Geochim. Cosmochim. Acta* 42:1199-1212, [3] Kallemeyn G.W. et al. (1989) *Geochim. Cosmochim. Acta* 53: 2747-2767, [4] Binz C. M. et al. (1976) *Geochim. Cosmochim. Acta* 40: 59-71, [5] Kong P. and Ebihara M. (1996) *Geochim. Cosmochim. Acta* 60: 2667-2680.