Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

MTT40-02 Room:201A Time:May 27 16:30-16:45

Estimation of bulk composition for meteoritic samples using handheld XRF

NIIHARA, Takafumi[1*] ; MIYAMOTO, Hideaki[1] ; HONG, Peng K.[1] ; OGUMA, Midori[1] ; DOHM, James M.[1]

[1]UMUT

Over 50,000 meteorites are recovered in hot and cold desert, and most of these meteorites are thought to originate from asteroids. The Hayabusa mission confirmed that the samples from asteroid Itokawa (S-type) have compositions similar to ordinary chondrites, therefore meteorites and asteroids have direct correlation, and thus the importance of meteorites increases to understand small bodies that could record early solar system histories. Direct comparison of meteorites and asteroids may produce important information of the surface materials of asteroids. Surface chemical composition can be obtained by onboard instruments such as APXS and GRS. On the other hand, bulk chemical composition for most meteorites are missing (only 10% have been analyzed) due to a limited mass of each sample. Therefore, most meteoritic samples cannot be analyzed using conventional techniques (e.g. INAA and XRF). To solve this issue, we are now developing an analytical procedure using a handheld XRF (Olympus Delta) to estimate bulk chemical composition without any sample preparation, although the accuracy of measurement is relatively lower than conventional techniques. The tube voltages of 40 kV and 10 kV are used for heavy elements (heavier than Ti) and light elements, respectively. The fundamental parameter method is adopted for calculation of elemental abundances and gives us semiquantitative values. One big problem of this method is analyzable elements are limited; light elements (lighter than Mg) cannot be detected with our instrument. In this presentation, we will report preliminary results of the precision and accuracy of measurement tested through geochemical standard (JB-3, JA-3, and JG-1a, supplied from geological survey of Japan). We currently calibrated for 6 major elements (Si, Ti, Al, Fe, Mn, and Ca) and can analyze within the variation of <5 % (GSJ values +/- 1 wt. %) in powder condition (soil cup with Mylar filter). Our purpose of this study is to expeditiously analyze the composition of a slab (or block) of the meteorites without any kind of sample preparation. We will continue to calibrate using slabs of diverse rock types stored in the UMUT.

Keywords: meteorite, asteroid, bulk composition