

## OSUMILITE-GROUP MINERALS IN THE NIO METEORITE: APPLICATION TO ITOKAWA SAMPLES.

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**Introduction:** The primordial osumilite-group minerals show mixed compositions with feldspar and mafic minerals [1]. The purpose of the paper is to elucidate osumilite-group minerals of the Nio chondrite (H3/4), Yamaguchi, Japan to the Itokawa grains [2-4].

**Osumilite-group minerals in meteorites:** The osumilite-group minerals defined on Earth minerals are minerals classified by cations of K, Na, Ca, Fe and Mg-rich mineral phases [1]. The Earth's osumilites-group minerals reveal two K-rich phases of the *K-Fe-rich phases* (sugilite, almarudite, klochite and merrihueite) and the *K-Mg-rich phases* (trattnerite, chayesite and friedrichbeckeite), where fine K-Fe, Mg-rich osumilites-group minerals in composition are different K-feldspar phases (due to much Fe and Mg) [3]. The Earth's *Na-Mg-rich phases* of the osumilites-group minerals (roedderite, yagiite and eifelite) have been reported as different Na-plagioclases (due to much Fe and Mg contents) [3] obtained at the Nio and Itokawa grains [2, 3]. However, *Na-Fe*, *Ca-Mg*- and *Ca-Fe-rich phases* are obtained in the Nio and Itokawa grains [2, 3], which some grains are described as fine Ca-plagioclases (without mafic contents) [3].

**Analysis and grouping of Nio osumilites-group minerals:** In-situ observation with nano-grains in the Nio chondrite by analytical SEM analyses (FE-SEM) reveals that new Ca-Mg and Na-Fe-rich and the known Na-Mg-rich types of osumilite-group minerals are formed in barred pyroxene chondrules with K-rich matrix as follows [2].

1) *Terrestrial osumilite-group types (on planet Earth):* K-Mg, Fe; Na-Mg and Ca (K)-rich types (in Earth).

2) *Extraterrestrial osumilite-group types (meteorites):* Ca-Fe, Mg and Na-Fe, Mg-rich types (Nio & Itokawa).

**Formation process:** The present analytical results indicate fine osumilite-group minerals in the Nio chondrules are formed by fluids of pyroxene and Ca, Na, K-rich plagioclase in composition to form separately in the matrix of chondrule during formation. The present result can be applied to the Itokawa grains [3] with tiny osumilites-group minerals in composition, though they are unknown collection site and heating process.

**Summary:** The following results are summarized: 1) The Nio chondrite contains new types of osumilite-group grains with Ca-Mg and Na-Fe types [2]. 2) Ca-Mg type osumilites-type grains are formed by melting with fluid compositions of pyroxene and Ca, Na, K-rich plagioclase during formation of Asteroids. 3) The Itokawa grains [3] contain tiny osumilites-group-like minerals in composition.

**References:** [1] Miura Y. 1986. Abstract #1258. 17<sup>th</sup> Lunar & Planetary Science. LPSC XVII, [2] Miura Y. 2001. *Meteoritics & Planetary Science* 36:A136. [3] Nakamura E. *et al.* 2012. *Procs. National Academy Science of U.S.A.* E624. [4] Miura Y. 2013. (in press).