UNGROPED CARBONACEOUS CHONDRITE, YAMATO 82094: CHARACTERISTIC FEATURES AND CLASSIFICATION.

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Introduction: Carbonaceous chondrites are classified into several groups. However, some are ungrouped [1]. Here we present a study of Y-82094. Although classified as CO3.5 [2], the texture is different from those of common CO chondrites [3], and it was classified as an unusual CO [4]. Here we report the characteristic features of Y-82094 and discuss its classification.

Petrography and Chemistry: Y-82094 contains refractory inclusions (CAI and AOA) (8 vol.%). However, the most abundant component is chondrules (78%), and matrix is distictly low (11%) compared to CO chondrites (~30% avergae matrix). The average chondrule size is 420μm [4]. Type II chondrules are rare and many Type I chondrules contain Fe-Ni metal spherules. Also, a silica phase is present in the mesostasis of some Type I chondrules. One chondrule contains a mineral which has the chemical composition of cordierite.

CAIs consist of melilite, spinel, Ca-rich pyroxene, and anorthite with hibonite, grossite, and perovskite. CAIs and AOAs usually contain small amounts of the secondary phases, such as nepheline and FeO-rich olivine. However, the FeO-rich rim of AOA olivine is usually less than 3μm in width, indicative of type 3.2 [5]. This classification is consistent with the characteristic features of Fe-Ni metal in the chondrules [6]. Matrix is dominantly FeO-rich olivine with minor low-Ca and high Ca-pyroxene, a Na-rich feldspathic component and FeNi metal.

The major and trace element compositions of Y-82094 were measured by ICP-MS. The refractory elements are enriched, like those in CV and CO chondrites, whreas volatile elements are remarkably depleted. The oxygen isotopic compositions are $\delta^{17}O$ = -7.62‰ and $\delta^{18}O$ = -4.52‰ [7].

Discussion: Y-82094 was classified as a CO chondrite, and the bulk and oxygen isotopic compositions are typical of CV or CO. However, it has features that distinguish it from the other C chondrites; 1) chondrule size is intermediate between CV and CO, 2) a silica phase and cordierite are present in some chondrules, 3) chondrules commonly contain Fe-Ni metal, and 4) the matrix is lower in abundance.

No similar C chondrite has been reported. Therefore, Y-82094 is an ungrouped C chondrite. Y-82094 as well as the other ungrouped chondrites [1] may suggest a wide range of poorly sampled chondrite parent bodies and/or a wider range of formation conditions than currently recorded by the major C chondrite groups.

References: [1] Weisberg, M.K. et al. 2006. *Meteorites and the Early Solar System II*, 19-52. [2] Sears, D.W.G. et al. 1991. *Proc. Lunar and Planetary Science* 21:493-512. [3] Scott, E.R.D. et al. 1992. *Geochimica et Cosmochimica Acta* 56:4281-4293. [4] Imae, N. and Kojima, H. 2000. *Antarctic Meteorite Research* 13: 55-64. [5] Chizmadia, L.J. et al. 2002. *Meteoritics & Planetary Science* 37: 1781–1796. [6] Kimura, M. et al. 2008. *Meteoritics and Planetary Science* 43: 1161-1177. [7] Yamaguchi, A. et al. 2012. *Meteorite Newsletter*, 21.