

## Classification and petrologic features of chondrites of petrologic type 7

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Chondrites are classified into petrologic types 1-6, which distinguish the degrees of aqueous alteration (types 1-2), and thermal metamorphism (types 4-6). In addition, a petrographic type 7 has also been proposed to indicate an even higher degree of thermal metamorphism [1]. Such chondrites contain only relict chondrules, and plagioclase is commonly coarse-grained. Low-Ca pyroxene contains >1% CaO. However, most of these chondrites may actually be melt rocks or melt breccias [2], and the occurrence of a type 7 is controversial problem. However, LEW 88663 seems to be a genuine type 7 chondrite [3], not a melt rock.

Here we report the preliminary results of our petrographic study on ordinary chondrites classified as type 7, to explore their thermal history, classification, and genetic relationships to melt breccia and others.

Many chondrites are classified as type 7 in NIPR and other collections (77 chondrites at present). However, the detailed petrography has been rarely reported for these chondrites. Here we studied 4 H7, 4 L7, and 4 LL7 in NIPR collections. We also examined Uden (LL7).

All of the chondrites studied here show a well recrystallized texture. Triple junctions among olivine and pyroxene is commonly observed. However, Y-790124 and -790446 include many chondrules, indicative of type 6. A-880844 and -880993 contain clasts of various petrologic types, and are genomict breccias (H5-6 and LL4-6, respectively). Although Y-790144 does not seem to contain any chondrules, it is shock-darkened chondrite, and has lost its original texture.

Y-74160 has been extensively studied [e.g., 4]. This chondrite, Y-791067, and Uden consist of clasts among fine-grained matrix. The clasts comprise coarse-grained olivine, low-Ca pyroxene, and plagioclase. Olivine is typically included as chadacryst in pyroxene. The matrix is also highly recrystallized. Friedrich et al. [5] suggested that Y-74160 and Uden were subjected to Fe-FeS mobilization. These chondrites experienced partial melting, recrystallization, and brecciation, and may be classified as recrystallized breccias.

On the other hand, five chondrites, Y-75008, -790120, and -790960 (H7s), Y-82088 (L7), and Y-82067 (LL7), contain no or only a few relic chondrule in each section. They show highly recrystallized texture, and are not subjected to brecciation and melting. Y-82067 has composition identical to equilibrated LL chondrites [5]. These five chondrites are temporarily classified as type 7, if type 7 chondrite is defined to have experienced only a high degree of thermal metamorphism.

We are now examining modal mineral abundances and conducting mineral analyses, which will shed light on the classification criteria for type 7 chondrites.

References: [1] Dodd et al. (1975) GCA, 39, 1585-1594. [2] Huss et al. (2006) in Meteorites and the Early Solar System II. [3] Mittlefehldt and Lindstrom (2001) MAPS, 36, 439-457. [4] Takeda et al. (1984) EPSL, 71, 329-339. [5] Friedrich et al. (2014) submitted to GCA.

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