DEEP THERMAL METAMORPHISM (NOT MELTING) OF ORDINARY AND CARBONACEOUS CHONDRITE PRECURSORS PRODUCED TYPE 7 AND PROPOSED TYPE 8 CHONDRITES

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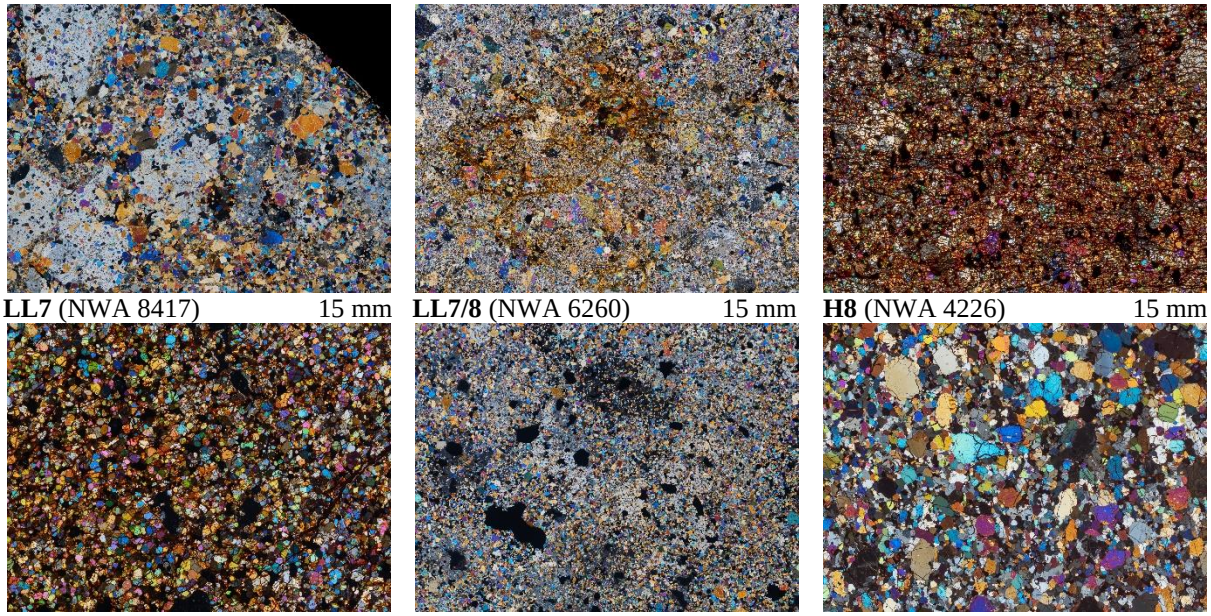
Progressive thermal metamorphism (driven mainly by ^{26}Al heating) of ordinary and carbonaceous chondrites should be expected to have occurred on their parent bodies as a function of increasing depth. The bodies that are the ultimate sources for the well-known H, L and LL chondrites of Types 3-6 and also many carbonaceous chondrites (mostly Types 2 and 3) were probably disaggregated long ago by major collisions. Any deeper, more thermally metamorphosed specimens, as well as samples of related mantles and cores (pallasites and irons), would be expected to be less voluminous and hence rarer as recovered meteorites. Over the past 15 years there has been a steady increase in the number of chondrule-free specimens possessing bulk elemental and isotopic (O, Cr, W) compositional affinities to the much more common chondrule-bearing specimens. The term *metachondrite* was proposed for these specimens [1], but adopting the suggestion by [2] a consensus developed that the proper terminology should be Type 7 chondrite.

Yet all "Type 7" chondrites are not texturally identical, and here we propose that an additional Type 8 category should be established to reflect those differences. Among specimens currently grouped as Type 7, there is a textural distinction between those that contain poikiloblastic aggregates of orthopyroxene oikocrysts enclosing olivine chadacrysts (logically representing recrystallized former chondrules) and others (here designated as Type 8) that possess a completely recrystallized, triple grain junction texture with no hint of either chondrules or oikocrysts. This textural evolution has parallels to the well-established sequence observed for terrestrial hornfelses in thermal metamorphic aureoles adjacent to intrusive plutons. Apart from Types 7 and 8 with affinities to H, L and LL chondrites, we recognize the following categories based on analogous textures: CR7 chondrites (Tafassasset, NWA 11561), CR8 chondrites (NWA 12455), CV8 chondrites (NWA 2653/3133 [3]), CK8 chondrites (NWA 8186 [4]), and Types 7 and 8 among acapulcoites and winonaites (which also evidently are related to chondrule-bearing precursors).



LL7 (NWA 8417) 15 mm **LL7/8** (NWA 6260) 15 mm **H8** (NWA 4226) 15 mm

CV8 (NWA 3133) 15 mm **CR7** (NWA 11431) 15 mm **CR8** (NWA 12455) 15 mm

Figure 1. Textures (in cross-polarized light) of proposed Type 7 and Type 8 chondrites. Photos © Neil Buckland.

References: [1] Irving A. *et al.* (2005) *68th Meteorit. Sci. Mtg.*, #5218. [2] Dodd R. *et al.* (1975) *GCA* **39**, 1585-1594. [3] Irving A. *et al.* (2004) *EOS, Trans. AGU*, #P31C-02. [4] Srinivasan P. *et al.* (2017) *LPS* **XLVIII**, #1995.