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The unique thermal history of H chondrites. Derek W. G. Sears and J. David Batchelor. Cosmochemistry Group, Department of Chemistry and Biochemistry, University of Arkansas, Fayetteville, AR 72701, USA.

At least two lines of evidence suggest that H chondrites experienced a different thermal history to the other ordinary chondrites. (1) The range of metamorphic conditions experienced by H chondrites is more limited than that of the L and LL chondrites. While the type 3H chondrites are all members of higher petrographic sub-types, the type 3 L and LL chondrites extend to lower sub-types (Fig. 1). Apparently, H3 chondrites were located in environments which resulted in higher levels of metamorphic alteration than the L3 and LL3 chondrites. In contrast, equilibrated L and LL chondrites are generally more equilibrated than equilibrated H chondrites; the dominant type for H chondrites is type 5, while for the L and LL chondrites it is type 6. (2) Metallographic cooling rates (data from Wood, 1979) indicate that equilibrated H chondrites generally cooled more rapidly than equilibrated members of the L and H chondrite classes (Fig. 2).

We have considered two possible explanations for the petrographic type distributions shown by the ordinary chondrite classes. (1) The ordinary chondrite parent bodies were internally heated by radioactive decay, possibly of ^{26}Al, so that the bodies had a simple spherically symmetrical temperature gradient with the highest temperatures at the center, and known H chondrites came from a more narrow range of burial depths than the other classes. This would explain their petrographic type distribution, but not their higher cooling rates. (2) Different physical properties of the H chondrites and the other classes are the crucial factor in determining thermal history. This would be important for any assumed heat source, but especially so for electrical or solar heating (Sonett and Reynolds, 1979). Because of their higher metal content, H chondrites have lower heat capacities and higher electrical and thermal conductivities than L and LL chondrites (Wood, 1963). This would mean that a heat pulse would move through them more quickly (fewer low type 3's) but would also dissipate more rapidly (fewer type 6's). Differences in physical properties between ordinary chondrite parent bodies are not unexpected. McCoy *et al.* (1990) invoked differences in thermal conductivity due to relative compaction of different LL parent bodies to explain a positive correlation between TL sensitivities and metallographic cooling rates for LL3 chondrites. We argue that the main factors governing thermal history of the different chondrite classes are their physical properties, and we think this favors induction and solar heating theories. References: McCoy T. J. *et al.* (1990) *LPS* **21,** 749–750. Sonett C. P. and Reynolds R. T. (1979) In *Asteroids* (ed T. Gehrels), 822–848. Wood J. A. (1963) In *The Moon, Meteorites, and Comets* (eds. B. M. Middlehurst and G. P. Kuiper), 337–401. Wood J. A. (1979) In *Asteroids* (ed. T. Gehrels), 849–891. Supported by NASA grant NAG 9-81.

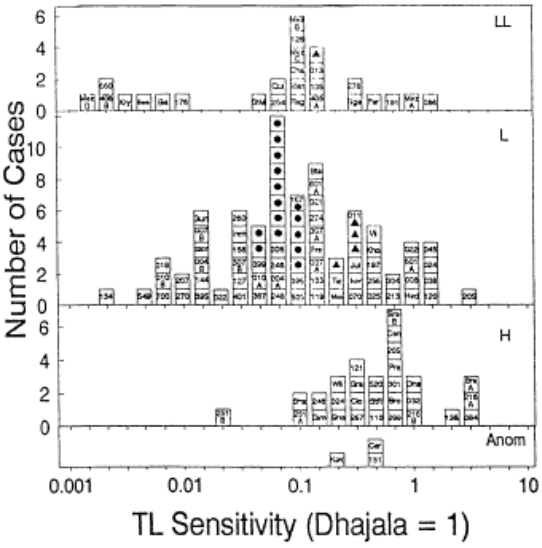

FIG. 1. Histogram of TL sensitivity for type 3 ordinary chondrites.

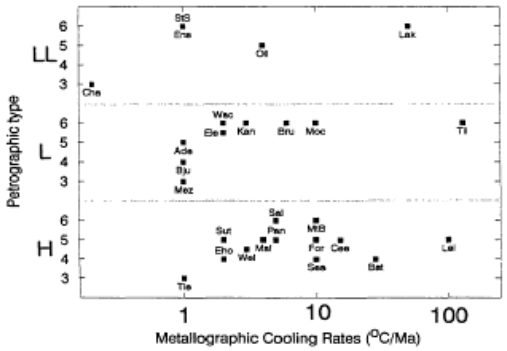

FIG. 2. Comparison of metallographic cooling rates for H, L and LL chondrites by petrographic type.