

THERMOLUMINESCENCE AND METAMORPHISM OF ALLENDE AND ITS CAI

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The TL sensitivity of ordinary chondrites shows a metamorphism-dependent 10^5 -fold range (Sears *et al.*, 1980); this reflects the production of feldspar, the TL phosphor, by crystallization of chondrule glass (Guimon *et al.*, 1985). Since several CAI from Allende may also constitute a metamorphic series (Meeker *et al.*, 1984), and contain numerous potential phosphors, we have examined the TL properties of Allende and several CAI. The major reaction occurring during metamorphism is the production of melilite from pyroxene and possibly plagioclase (Meeker *et al.*, 1984); melilite and plagioclase are TL phosphors (with different glow curves), Fe-bearing pyroxenes are not.

Samples of bulk powder were ground, homogenized, 30-40 mg aliquants placed in quartz vials and annealed in wire-wound tube furnaces at the temperatures and for the times indicated in Figure 1. The CAI, Egg 4, Egg 3, Egg 6, Big Al and Pink Angel, were provided by G. Wasserburg, who also provided density separates. Meeker *et al.* (1984) suggested that Egg 4 has experienced metamorphism throughout, while Egg 3 and Egg 6 contain altered mantles and pristine cores.

At low annealing temperatures there is a peak at 120°C and at higher annealing temperatures there is a peak at 190-200°C; the TL peak for low-temperature feldspar, type 3.2-3.4 ordinary and CO chondrites moves from ~ 120 to ~ 200°C as the feldspar disorders (Guimon *et al.*, 1985; Keck and Sears, 1986b). The peaks at 250°C and 340°C may also be associated with feldspar; a 250°C peak in the glow curves of CO chondrites was identified with amoeboid inclusions by Keck and Sears (1986a). Melilite from Egg 3 has a peak at 400°C, and peaks at 400°C in the annealing data are probably due to this mineral. The CAI (Fig. 2) tend to have peaks at 400°C (Egg 4 interior and Egg 3 melilite), 220-250°C (Big Al rim, Big Al interior, and density separates — anorthite and possibly melilite — from Egg 3 and Egg 6), and 110°C (Pink Angel rim). We suggest that the data reflect the relative

amounts of melilite and its precursor (probably anorthite), consistent with the observations of Meeker *et al.* (1984). This being so, Big Al appears to have escaped metamorphism throughout, as the interior yields a similar curve to the rim and neither are dominated by a major 400°C peak. The Pink Angel sample appears to have low temperature feldspar as its dominant phosphor, in which case our sample may have contained a significant quantity of Allende matrix. Our data suggest that the meteorite-wide metamorphism suffered by Allende was comparable to that experienced by type 3.2-3.5 ordinary chondrites.

Guimon *et al.*, 1985. *GCA* **49**, 1515.
 Keck and Sears, 1986a. *LPS XVII*, 412.
 Keck and Sears, 1986b. *GCA*, submitted.
 Meeker *et al.*, 1984. *GCA* **47**, 707.
 Sears *et al.*, 1980. *Nature* **287**, 791.

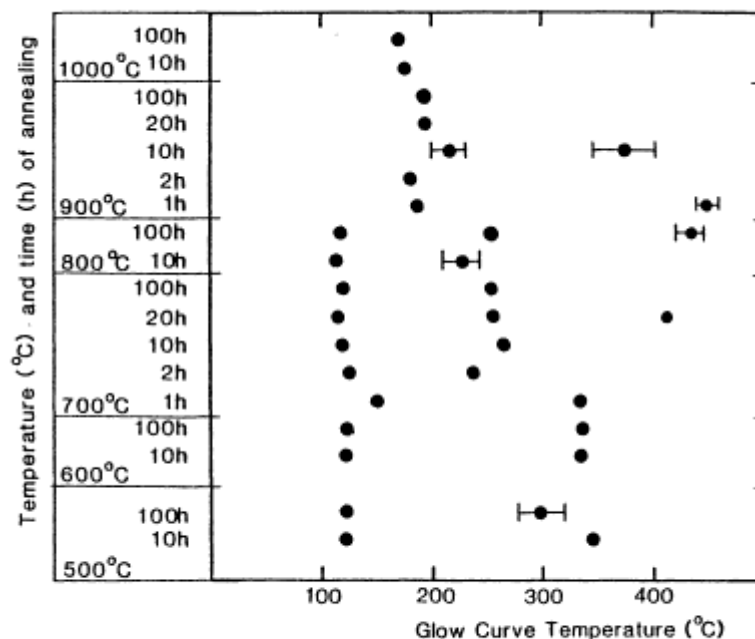


Fig. 1

Guimon, R.K. and Sears, D.W.G. (1986) Thermoluminescence and metamorphism of Allende and its CAI. *Meteoritics*, **21**, 381-382.