

THERMOLUMINESCENCE AS A PALEOTHERMOMETER?;

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An important phase in the history of chondritic meteorites is a period of metamorphism. Thermoluminescence has been shown to be a powerful technique for investigating metamorphic effects, particularly for the least metamorphosed meteorites (1). The ordinary chondrites as a whole exhibit a 10^5 -fold range in their TL sensitivities, while the least metamorphosed type 3 ordinary chondrites show a 10^3 -fold range. Associated with this range in TL sensitivity are variations in the temperature at which maximum TL emission occurs and also in the range of temperature over which emission occurs (2).

In the present paper, we present the results of annealing experiments on a little-metamorphosed ordinary chondrite (A77011, type 3.5). Samples were annealed for 100 hours at temperatures ranging from 500 to 1000 C in a nitrogen atmosphere. The TL emission characteristics of the annealed samples show trends which are very similar to those observed in meteorites which have been naturally metamorphosed to different extents. The temperature at which maximum emission occurs in both our annealed samples and in naturally metamorphosed type 3 chondrites shows an increase of 80 - 100 C relative to the unannealed or least metamorphosed samples. The temperature range in which TL emission is observed shows corresponding increases of about 50%. This broadening and movement to higher temperatures of the peak is also similar to the effects produced by experiments on terrestrial albite (3,4) where the changes observed were associated with a low to high temperature transformation. These data suggest that the TL phosphor is feldspar and also that TL may be used to estimate paleotemperatures for little-metamorphosed, unequilibrated meteorites.

References. 1. Sears, D.W., Grossman, J.N. and Melcher, C.L. (1980) *Nature* 287, 791-796. 2. Sears, D.W., Grossman, J.N. and Melcher, C.L. (1982) *Geochim. Cosmochim. Acta* 46, 2471-2481. 3. Pasternak, E.S., (1978) Ph.D. Thesis, Univ. of Pennsylvania. 4. Pasternak, E.S., Gains A.M. and Levy, P.W. (1976) *Geol. Soc. Amer. Abstracts with Program* 8, 1044.

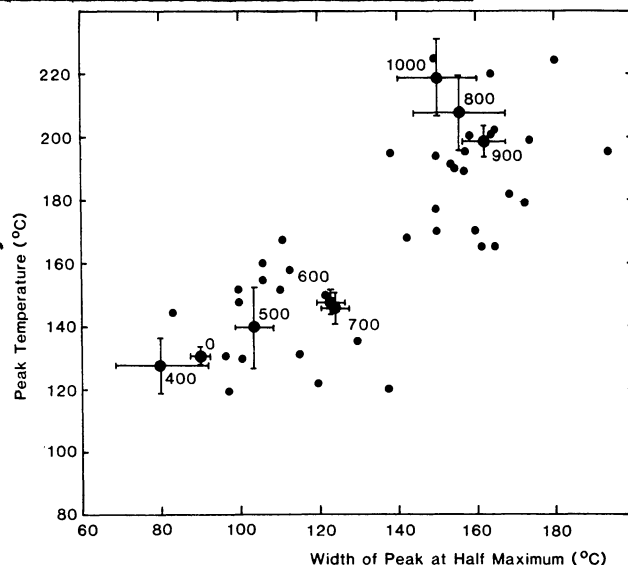


Fig 1. TL peak temperature vs. peak width for samples of Allan Hills A77011 annealed to various temperatures (large points, temperatures in C) and type 3 ordinary chondrites (small points).