THERMOLUMINESCENCE OF INCLUSIONS FROM THE CUMBERLAND FALLS METEORITE. **Munir Haq, Fouad A. Hasan and Derek W.G. Sears. Department of Chemistry, University of Arkansas, Fayetteville, AR 72701.**

Cumberland Falls is a breccia consisting of unusual chondritic clasts in an aubritic host. The unusual properties of the clasts, and systematic variations in these properties, have been ascribed to (i) extensive reaction between clasts and host, probably during implacement (1), (ii) nebular (and pre-implacement metamorphic) processes, so that the clasts represent an additional kind of type 3 (or lower) material (2). Since the thermoluminescence properties of type 3 ordinary chondrites are very distinctive (3), and TL is very sensitive to mild metamorphism and annealing (4), we have measured the TL properties of 6 clast and 6 adjacent host samples from Cumberland Falls and we have performed annealing experiments on material from one of the inclusions.

4 mg aliquants of non-magnetic powders prepared from 200 mg chips of inclusions 604-2, 604-5, 604-7, 604-9, CF-X and 2739-1, and adjacent regions of host matrix, were measured in the manner described by Ref. 5; samples of 604-9, and matrix from near 2739-1, were also annealed in the manner described in Ref. 4 and their TL properties measured.

The inclusions produced glow curves with similar shapes to those of ordinary chondrites and very different to those of the host samples and aubrites; for the aubrites and Cumberland falls host, TL glow curves consist of two very sharp peaks. Like the type 3 ordinary chondrites, the inclusions showed distinctive TL properties in which TL sensitivity, peak width and peak temperature increase with increasing levels of metamorphism indicated by petrologic data (2). TL sensitivities were in the range of type 3.4-3.6 ordinary chondrites. The annealing treatment of inclusion 604-9 produced increases in peak temperature and width, and decreases in TL sensitivity, similar those produced by type 3 ordinary chondrites. Thus the annealing treatment reproduced the temperature-width trend in the inclusions, but not the TL sensitivity increases observed. The annealing treatment caused no changes to the TL properties of the host material.

The similarity of the TL trends for the inclusions with those of the type 3 ordinary chondrites, and their relationship with petrologic evidence for a metamorphic spectrum in these inclusions, suggests that the inclusions are metamorphic series of primitive (i.e. type 3-like) ordinary chondrites. The TL data indicate that the inclusions have not been heated in excess of 800^{o}C for 100 h (or the equivalent) since the formation of the feldspar. The TL properties of the feldspar suggest that it has the same history as that of type 3 ordinary chondrites (formation through devitrification of chondrule glass during very slow cooling, so that both high and low temperature forms are now present). In this case, the feldspar predates implacement, and extensive reaction between the host and clasts seems unlikely.

1. Kallemeyn and Wasson 1985 GCA 49, 261; 2. Neal & Lipschutz 1981 GCA 45, 2091; 3. Sears et al 1982 GCA 46, 2471; 4. Sears & Weeks 1983 JGR 88, B301; 5. Guimon et al 1985 GCA 49, 1515. (Supported by NASA grant NAG 9-81).

TL OF CUMBERLAND FALLS

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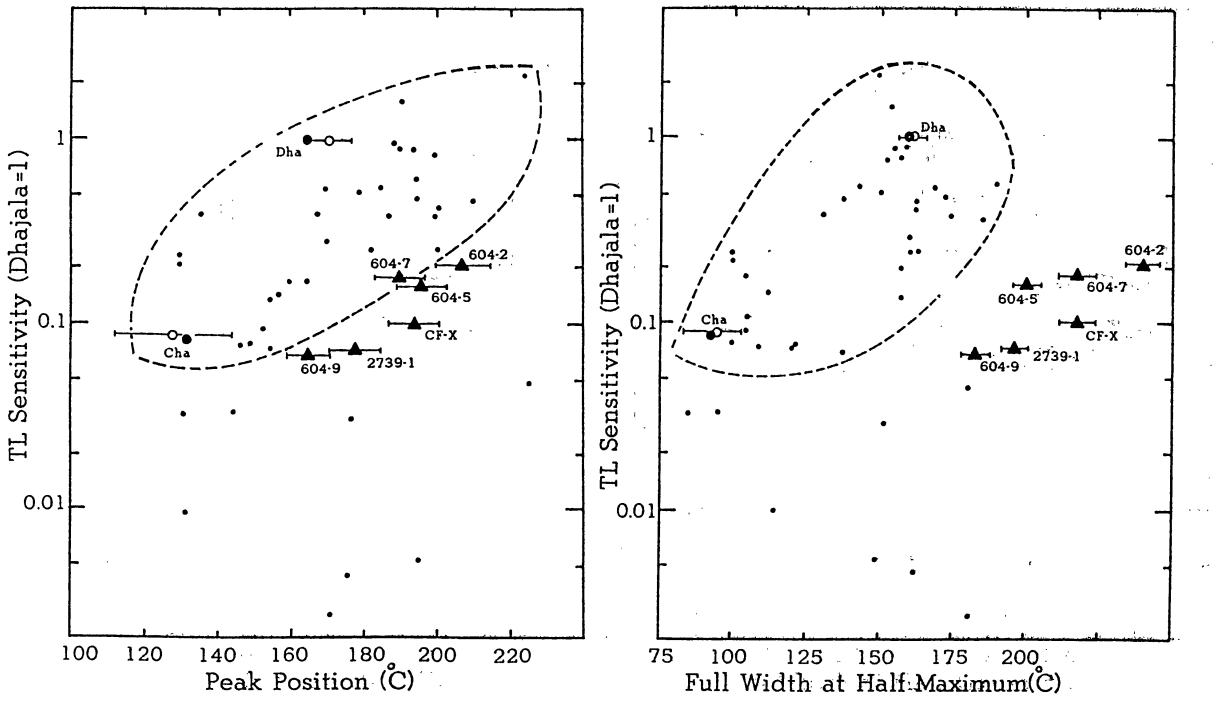

Fig. 1 TL sensitivity vs. peak temperature (left) and vs. peak width (right) for 6 Cumberland Falls inclusions. The data and fields occupied by the type 3 ordinary chondrites (Ref. 3) are also indicated. 'Dha' and 'Cha' refer to data for Dhajala and Chainpur which were measured as standards.