

THE INDUCED-THERMOLUMINESCENCE PROPERTIES OF  
METEORITES AN THEIR SHOCK AND METAMORPHIC HISTORY

DEREK W.G. SEARS (Department of Chemistry,  
University of Arkansas, Fayetteville, Arkansas,  
72701, USA).

The amount and emission characteristics of the thermoluminescence (TL) that can be induced in samples whose natural TL has been removed, provide a unique means of looking at the nature and amount of the phosphor. This is so even when the phosphor is in trace amounts and other techniques, such as X-ray diffraction and optical methods, are difficult or impossible to apply. In most meteorites the TL phosphor is feldspar, which undergoes a variety of TL sensitive changes in response to shock and metamorphic processes. It is possible to quantify these changes with experiments in which meteorite and terrestrial feldspar samples are annealed or shock-loaded, and in recent years the technique has proved of great value in determining the relative levels of low-grade metamorphism suffered by the type 3 (unequilibrated) ordinary chondrites, in detecting differences in the thermal history of separated chondrules from the Dhajala meteorite, deciphering the post-shock thermal history of shergottites and quantifying the shock history of type 4-6 (equilibrated) ordinary chondrites; the latter provide independent evidence that Antarctic meteorites may derive from a different source to non-Antarctic meteorites. Currently, efforts are underway to apply the technique to the study of gas-rich regolith breccias, and the origin of the unusual dark matrix, and of inclusions from the Allende meteorite which petrographic data suggest may represent a metamorphic sequence.