

THERMOLUMINESCENCE OF CHONDRULES FROM THE
NIKOLSKOE L4 AND OKHANSK H4 ORDINARY CHONDRITES:
INFLUENCE OF THE SHOCK PRESSURE ON
THERMOLUMINESCENCE PARAMETERS?

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Thermoluminescence (TL) investigations of the ordinary chondrite matter (see for example /1,2/) show that the major TL-phosphor in these objects is a feldspar. This feldspar formed from the chondrule mesostasis glass devitrified up to different degree for the individual chondrules and during the low-grade metamorphism of the meteorite matter as well /3/. The first perhaps must be connected with the shock-thermal history for the each chondrule as individual object at the preaccretion stage of the meteorite parent body formation.

In the present paper we report the results of TL analyses of the chondrules separated from two Nikolskoe L4 and Okhansk H4 ordinary chondrites. These low-metamorphised chondrites have been referred to the petrologic Type 4, but they have experienced the varying degrees of shock effects /4,5/. The first meteorite was affected by comparatively weak shock deformation, while the matter of the Okhansk chondrite has the properties of middle to high shock pressure degree.

The measuring of the TL-parameters was doing with help of the high-sensitivity equipment that gives the possibility to register very low TL intensities in the samples weighing up to $\sim 0,05$ mg. The typical glow curves for the artificial TL induced in chondrules by ^{137}Cs γ -rays (dose about of 100 krad) are presented in Fig. 1. A quite difference between the TL glow curves can be seen: the single peak for Nikolskoe chondrite (peak temperature $T_{\text{peak}} = 180^\circ\text{C}$, peak width FWHM = 70°C) and at least double peak ($T_{\text{peak}} = 145$ and 180°C , the total FWHM = 90°C) for the Okhansk chondrite. The relation (η) of low-temperature ($T \leq 260^\circ\text{C}$) to high-temperature TL-sensitivity corresponds the relative amount of the feldspar of low- and high-temperature forms /2/. It can be seen in the Fig. 2 that the main part of the TL-sensitivities of 60 chondrules from Okhansk chondrite ranges from $\eta = 50$ to 200. The analogical η -parameter for the Nikolskoe chondrules is equal to 10 - 20 as a rule.

X-ray structure analysis for the ten chondrules from the Okhansk chondrite that have the very high and conversely the lowest TL-sensitivities shows, that the amount of the feldspar in these chondrules is smaller than 5 wt. %.

On the base of obtained data we conclude that one of

the possible reason for the observed difference of TL-parameters for chondrules from the Nikolskoe and Okhansk chondrites may be the occurrence of the additional low-energy levels in the Okhansk chondrule feldspar. The formation of these levels may be caused by higher shock pressure (up to 20 - 30 GPa) experienced by this meteorite /5/. In addition the values and variability of η -parameter for the Okhansk chondrules permits us to assume that the traces of the individual shock-thermal history on the preaccretion stage were stored by each chondrule.

References. 1) Sears D.W.G. et al. (1984) *Geochim. Cosmochim. Acta*, 48, p.1189. 2) Guimon R.K. et al. (1985) *Geochim. Cosmochim. Acta*, 49, p.1515. 3) Sears D.W.G. et al. (1980) *Nature*, 287, p.791. 4) Dodd R.I., Jorasewich E. (1979) *Earth Planet Sci. Lett.*, 44, p.335. 5) Lavrukchina A.K., Baryshnikova G.V. (1978) *Cosmitscheskia Mineralogia*, XI congress MMA, Novosibirsk, p.53.

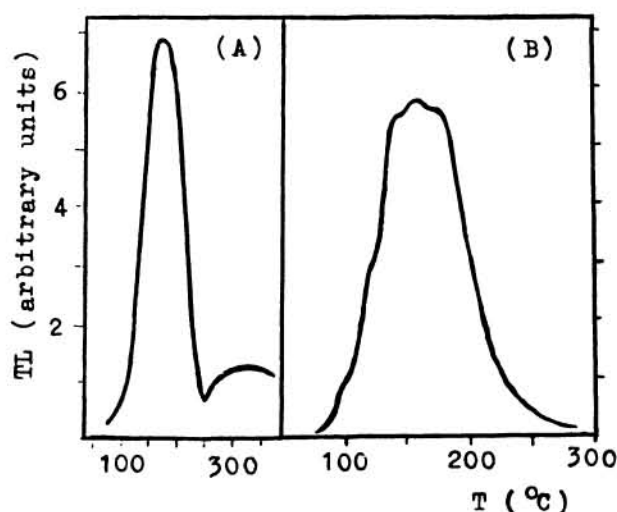


Fig. 1. Plots of the TL, induced by ^{137}Cs against temperature for the Nikolskoe (A) and Okhansk (B) chondrules

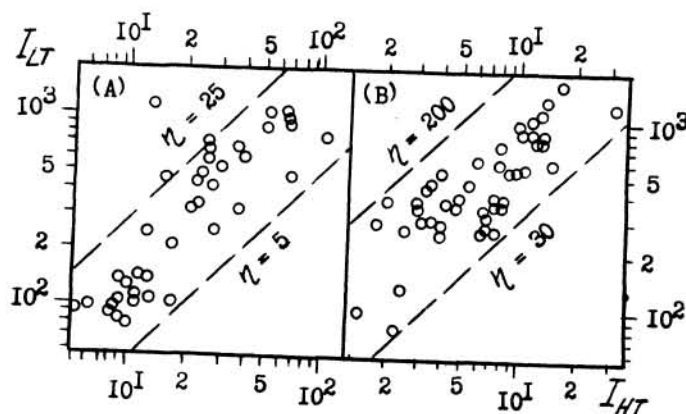


Fig. 2. Low-temperature (I_{LT}) against high-temperature (I_{HT}) TL-sensitivities for chondrules from the Nikolskoe (A) and Okhansk (B) chondrites