

Deconvolution on CaF:N glowcurves induced by ultraviolet (UV)

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Introduction: Calcium fluoride, CaF:N, is one of the earliest known thermoluminescence (TL) materials and was among the first used for TL dosimetry due to their high sensitivity. In this study we deal with the computerized glow curve deconvolution analysis of thermoluminescence glow curves. The information by the CGCD is very useful in order to understand the thermoluminescence mechanism of materials.

Experimental Procedure: The sample used in this experiment was natural (fluorite) in the form of powdered crystals in two colours green and violet. All samples were first annealed up to 500°C for 1 hour. TL measurements were carried out using a Harshaw 3500 TLD-Reader. The irradiations were applied through a ⁹⁰Sr/⁹⁰Y beta particle source. All measurements were performed in a nitrogen atmosphere with a low constant heating rate of 2°C/s, in order to avoid significant temperature lag, and the samples were heated up to the maximum temperature of 400°C. The following experimental procedure was applied:

S1: Test Dose (TD) 1,72Gy and TL up to T_{max}: 400 °C.

S2: Exposure in UV light for t_i and TL up to T_{max}: 400 °C.

S3: Repeat S2 for various times. Where t_i= 10sec, 20sec, 40sec, 80sec, 160sec, 320sec, 640sec, 1280sec, 2560sec, and 5120sec.

Results: All glow-curves were analysed using a (CGCD). The analytical expression used was that of general order kinetic (GOK)[3], examples of CGCD are shown in fig1:

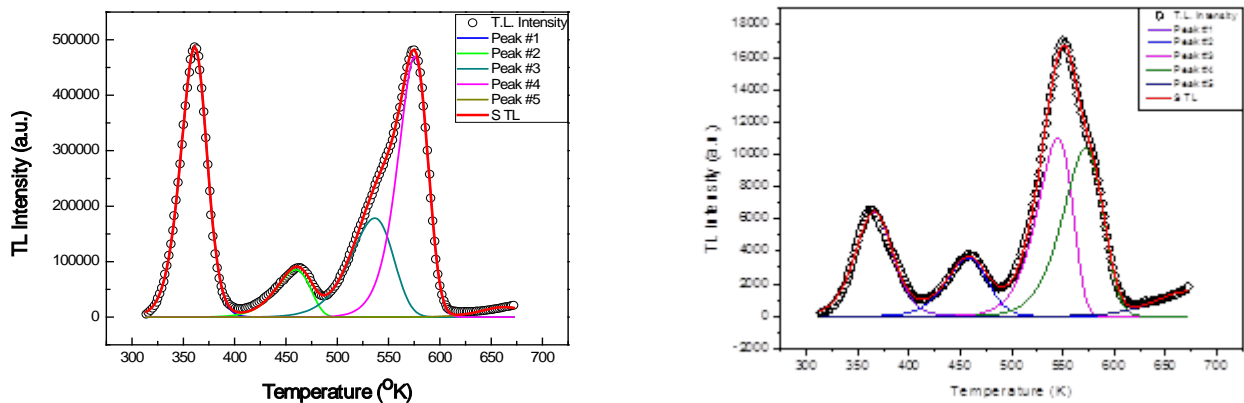


Fig. 1: Deconvolution on CaF:N exposed in UV light for t_i=640sec (left: green sample) (right: violet sample)

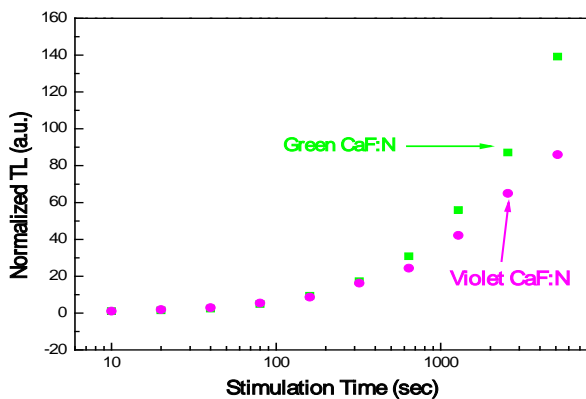


Fig. 2: normalized TL vs stimulation time on UV irradiation

References:

1. H. Tugay, Z. Yegingil, T. Dogan, N. Nur, N. Yazici, NIM B 267 (2009) 3640–3651.
2. F.O. Ogundarea, F.A. Balogun, L.A. Hussaina, Radiation Measurements 38 (2004) 281 – 286
3. G Kitis, J M Gomez-Ros and J W N Tuyn, J. Phys. D: Appl. Phys. 31(1998)2636-2641