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Research Article

Effect of temperature on the lyoluminescence of γ-irradiated stroncium doped sodium chloride

Dr. Vivek Ambalkar,

Department of Physics, D. P. Vipra College, Bilaspur - Chhattisgarh-495001
vambalkar@gmail.com

Abstract

Obviously, the dependence of intensity of Lyoluminescence on the temperature is extremely interesting from the experimental and theoretical point of view. The investigation of the temperature dependence of Lyoluminescence provides important information's as to the nature of luminescence centers. Extensive studies have been made on the temperature dependence of the LL of several organic and inorganic crystals. This paper reports the effect of temperature on the Lyoluminescence of stroncium doped sodium chloride sample. When the doped NaCl samples irradiated using ^{60}Co source are dissolved in a suitable solvent like distilled water, the LL intensity increase with time, attains a maximum value, then it decreases and finally disappears. Peak intensity is maximum at a specific temperature.

Introduction:

Lyoluminescence phenomenon was first observed by Wiedmann & Schmidt (1) in 1895. This is the phenomenon in which irradiated alkali metal halides emit light when dissolved in water, and then there was no study on lyolumniscence (LL) for the next 5 decade (2). The next reference of to research of LL appears to be 1959, where Ahnstrom & Ehrenstein (3) investigated in brief the LL phenomenon. Westmark and Grapengeissor (4) in 1960 found experiments in which not only organic phosphor however additionally the inorganic NaCl, Lif & KI had been determined. After the several discussions it is determined using LL with inside the have a look at of loose radical response and the role of F-centre in the LL of irradiated NaCl dissolved in fluorescent solution (5, 6). After 1970 using lyolumniscene for radiation dosimmetery turned into proposed through Ettinger and Puite (7, 8). In the present paper we report the effect of temperature on the lyoluminiscence of irradiated stroncium doped sodium chloride (NaCl).

Methods & Materials:

For the research of LL intensity and impact of temperature the NaCl crystal had been grown for special attention of dopant & special typed of the pattern grown for present research. The stroncium doped NaCl had been grown from the gradual cooling in their melt. The microcrystal was grown through the use of micro test services into distinctive sizes. Than the sample had been coloration be exposing them to ^{60}Co source for the dimension of effect of temperature at the LL intensity, the solvent (i.e., distilled water) turned into heated at precise temperature i.e.,30℃, 45℃, 60℃, 75℃ & 90℃ turned into injected to the colored pattern and the mild emission was detected through photomultipliers tubes kept in a box. The LL intensity produced is detected via way of means of PMT whose output connects to X-Y recorder.

Result:

1. Figure 1 shows the time dependence of LL intensity for γ-irradiated stroncium impurity-doped LL. NaCl crystals for unique temperature. It is determined that from the figure when γ - irradiated microcrystal samples is dissolved in with time, then the LL intensity initially will increase with time, attains a maximum value, then it decreases and eventually disappeared.

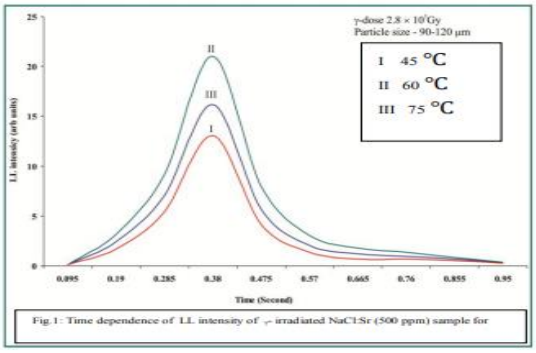

Fig.1: Time dependence of LL intensity of γ- irradiated NaCl:Sr (500 ppm) sample for

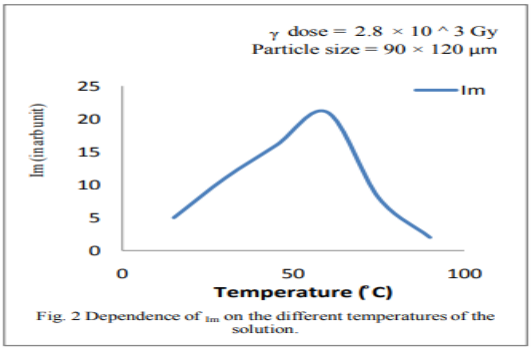

Fig. 2 Dependence of I_m on the different temperatures of the solution.

2. Fig.2 shows that the I_m (maximum intensity) is optimum for the particular temperature of the solution.

Discussion:

Dissolved in distilled water in γ-irradiated doped NaCl samples, then electrons are released from the F centre and form hydrated electrons (e_{aq}) takes place ,Subsequent recombination of the hydrated electron with its counterpart (V_2-centre) at the water-solid interface then yields lu gives rise to luminescence, schematically the mechanism of LL may be describe by the following equation,

$$F_{centre} \rightarrow [e^-_{aq}]$$
$$[e^-_{aq}] + V_{2centre} \rightarrow h\vartheta$$
(Water solid state interface)

Chandra et.al (9) has derived the expression for I_m which are as given below:

$$I_m = \eta \Upsilon n_f N_0 \alpha \ldots\ldots\ldots\ldots (1)$$

Equation (1) indicates that I_m should be optimum for a particular temperature of the solution.

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