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# A Study of Photo physical Properties of End Polymeric Material

**Jahangir Payamara**

**Shahed University , Physics Department ,Science Faculty,
P.O.Box: 18151-159,Tehran- IRAN**

***Corres.author: jahangirpayamara@yahoo.com***

**Abstract:** There have been investigated luminescence features of organic matter of GACH deparafinization GD and on its base PEHP have been developed. It is established that at excitation of organic matter of GD and developed on its base polymeric modification by light of 363 nm of mercury they transform effectively IR radiation into visible light. From temperature dependence of photoluminescence intensity it is determined activation energy of traps taken place in the quenching process of photoluminescence. This paper presents the experimental result of establishment new organic photo luminophore, development of its introduction technology into polymeric matrix and study of photo physical properties of end polymeric material.
**Keywords:** Photo physical properties, Luminophore, Transform, IR radiation, PEHP, GD.

## Introduction

Luminophores implanted in the polymeric matrices are used extensively in creation of systems for optical recording information display, radiation converters and for extension of polymeric lifetimes. Decision of this problem requires detailed study of physico-chemical properties of polymer- luminophore systems introduction, methods of functional groups of luminophore in polymer and photo physical processes being at its absorption of light. Into feedstock photoluminescence modification of polyethylene of high pressure (PEHP) by method of mechanical mixing there has been dropped proposed impurity in amount of 0.5-6.0% (in mass).

## Measurements

For attainment of homogeneous distribution of luminophore of GD in PEHP composition it is made then repeat regranulation. Film formations of PEHP granules and modifications on its base are carried out by extrusion method with inflation of industrial equipment of LRP 45-700M model. Film thickness is of 40 micrometer.

Samples from the set of developed films and of luminophore of GD as disk of $2\times10^{-2}\times2\times10^{-3}$ square meter in size at temperature T 453°k, 313°k and pressures 10, 30 MPa are obtained respectively. In stationary regime in the temperature range 100-300°k samples are excited by light of 365 nm of mercury and automatic recording of radiation spectra are carried out installation mounted on the base of spectrometer SDL-1 (N. Georgobiani 1995 & G.C.Righin,2005). Subjects of research are PEHP of various model (10803-020, 15302-003, 15803-020, 17504-006) and photo luminophore of organic matter of GD. Results of photo luminophore (PL) of organic matter of GD at temperature 293°k are listed in fig.1, curve 1.

## Mathematical method

Taking into consideration that probability of radioactive transition does not depend on temperature and probability without irradiative transition is defined by charge release with luminescence centre and consequently it grows with T rise proportionally with the factor Boltzmann [M. Gurvich, 1982 & G. Esposito, 2005].

$$I/I_0 = \frac{1}{1+q\exp\left(-\frac{E_A}{KT}\right)}$$

Where q-pre-exponential factor including the relation of concentration of quenching centre to concentration of luminescence centre, K-Boltzmann constant, T-absolute temperature, $E_A$-activation energy of luminescence centre, $I_0$-luminescence intensity at quenching absence, I-at quenching presence of luminophore of GD(curve1). This equation expresses the regularity of increasing of role of quenching processes with temperature rise.

## Results and Discussion

Investigation results of photo luminophore (PL) of organic matter of GD at T 293K are listed in fig.1, curve1. For comparison in fig.1, it is listed luminescence spectrum of PEHP of 15803-020 model with GD impurity in 40% (in mass) (curve 2). The similar results are obtained for other models of PEHP. It should be noted that PEHP of various models without luminophore impurity at their excitation by IR-radiation they do not have PL.

It is seen from fig.1 that PL of spectrum of organic luminophore and obtained on its base modification of PEHP curves the range 400-590 nm with maximum at 495nm. At the same time at identical equal conditions the intensity of PL of given organic luminophore of GD composition of PEHP is distinctly reduced. It is mainly can be connected with the character of polymeric medium in matrix of which it is implanted photo luminophore and also with the feature of polymetric modification structures on over-molecular level [Abbasov T.F., 1991, & G.C.Righini,2005]. In fig.2 there have been listed dependence of intensity of PL, $I/I_0$ on temperature, where I- at quenching presence of luminophore of GD (curve 1) and developed of its base modification of PEHP (curve 2). It is seen that with the rise of temperature the intensity of PL of luminophore of GD & PEHP modifications is reduced. It can be connected with the quenching in deep electron lraps at the expense of recombination interaction of impurity centre having usually effective charges of opposite sings. Thus at recombination interaction part of non -irradiative transitions will be grown with the rise of temperature and decrease of excitation intensity.

It is also seen that quenching plays a significant role as earlier as less $E_A$, i.e. than nearer level of luminescence centre to valence band. To estimate activation energy $E_A$ of luminescence centre on the base of obtained data it has been constructed dependence $\lg\left(\frac{I}{I_0}-1\right)$ on $\frac{1}{T}$. These results are shown in fig.3. It is seen that in mentioned coordinate for both samples there have been formed straight lines with band, for each sections to slope of which one can determine $E_A$. Thus, observed band of straight lines in coordinate $\lg\left(\frac{I}{I_0}-1\right)\approx\frac{1}{T}$ denotes that in suggested luminophore and developed on its base modifications of PEHP there are two different energy levels of luminescence centre. It is evidenced by calculation results of $E_A$ to slope of first and second section of straight lines which are 0.163, 0.028 for luminophore of GD and for PEHP with impurities are 0.126, 0.066 ev respectively. Obtained evidence of activation energy of luminescence centre allows to pre determine of decisive role of local levels in this process.

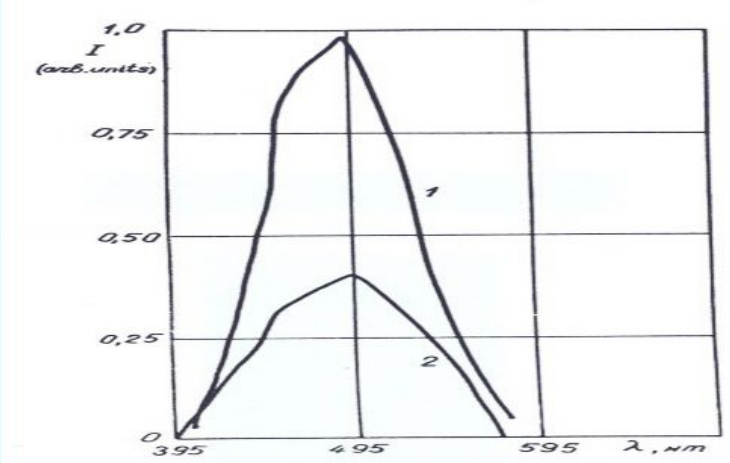

**Fig.1 PL spectra wavelength VS intensity.**

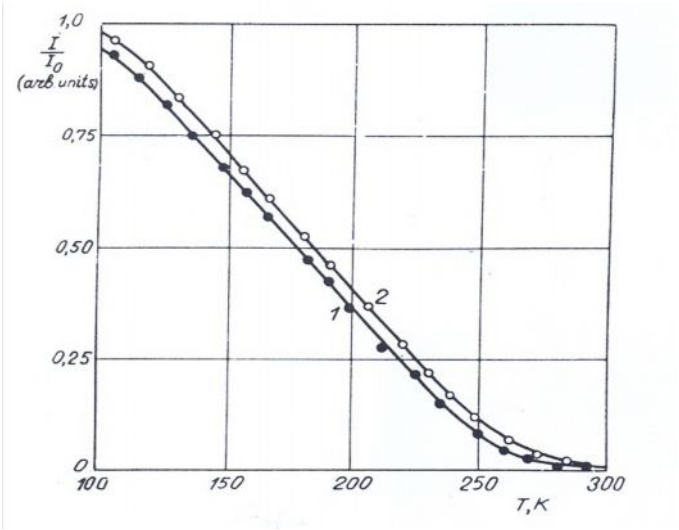


**Fig.2. Temperature dependence versus I/Io.**

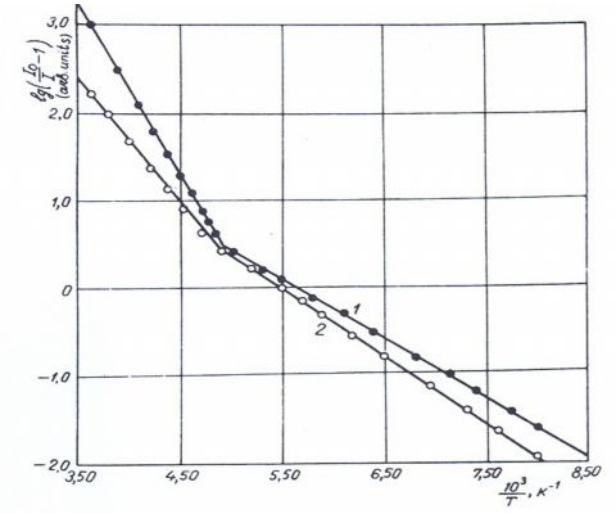


**Fig.3. Temperature dependence versus 1/T.**

## Conclusions

New organic luminophore is revealed and on its base photo luminescent polymer material is developed. It is shown that at excitation of organic matter GD & on its base developed modifications of PEHP by light of 365 nm of mercury transforms IR radiation into visible light with intensity maximum of luminescence of wave length 498nm. On the base of obtained results there have been calculated activation energies of luminescence centre responsible to photo luminescent processes.

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## References


1. Georgobiani A.N., Tagiev B.G. Tagiev O.B., Tzzatov B.M., "Photoluminescence of rare-earth elements in $CaGa_2S_4$ compounds." Neorganicheskiye materiali, 1955, Vol.31, No.1, pp.19-22.
2. Righini GC & Ferrari M. "Photoluminescence of rare-earth-doped glasses" Jr. Photoluminescence of rare-earth elements 2005, Vol.28, No.12. pp.1-35.
3. Gurvich A.M., "Introduction to physical chemistry of crystallophosphors." Moskva, Vischaya shkola, 1982, p.29.
4. Esposito G., Marmo G. From Classical to Quantum Mechanics. 2005, Cambridge, p.485.
5. Abbasov T.F., "Pecularities of electrophysical mechanical properties and structures of polymers modified by small impurities." 1991, p.185.
6. Wunderlich B. Thermal Analysis of Polymeric Materials 2005, Springer pp.796.


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