INFLUENCE OF TEMPERATURE-TEMPORARY CONDITION OF CRYSTALLIZATION AND DISCHARGE PROCESSING ON SPECTRA OF PHOTOLUMINESCENCE OF COMPOSITIONS ON THE BASIS OF POLYMER – SEMICONDUCTOR

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The influence of temperature-temporary condition of crystallization of polymer matrix and discharge processing on the spectra of photoluminescence of compositions on the basis of 70% PVDF + 30% CdS and 70% PEHD + 30% CdS at the range of wavelengths l=350÷650 nm is investigated. The assumption is stated that the technology of reception and discharge processing of composition influences on interaction between phases, on structure of interphase layer and on charging condition of the composition.

The change photoelectric and electrophysical properties of polymer compositions on the basis of polymer – semiconductor can occur not only at the expense of variation of these properties of separate components, and also at the expense of change of interaction between phases of a polymer matrix and particles of semiconductor [1-3]. The interaction between phases besides their nature also depends on other factors, for example, on technology of composition preparation, on influence of external factors on them. One of the ways of change of interphase interactions in polymer compositions is their preparation at various temperature-temporary conditions of crystallization and discharge processing.

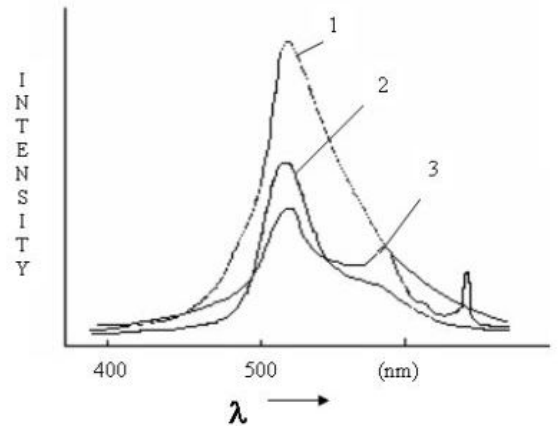

Fig.1. Spectra of photoluminescence of compositions 70% PVDF+ +30% CdS at T=293K 1. pure CdS; 2. 70% PVDF+30% CdS by FC; 3. 70% PVDF + 30% CdS by SC

In the given work the results of research of influence of temperature-temporary conditions of crystallization of polymer matrixes and discharge processing on photoluminescence of compositions on the basis of Polyvinylidenfluoride (PVDF), Polyethylene of high density (PEHD) and photosensitive semiconductor as filler of the cadmium sulphide (CdS) at the range of wavelengths l=350÷650 nm are presented.

The photoluminescent polymer compositions were prepared by the method of hot pressing at the melting temperature of polymer matrix under pressure 15 ÌPà during 15 min., at the condition of "fast cooling" (FC) with rate 1000°C/min, and at the condition of "slow cooling" (SC) with the rate 15°C/min. Semiconductors with sizes of particles 50<d<63 microns were used. Mechanical and electrical durability, and also dielectric characteristics of investigated compositions were determined at the temperature 293 K, and last were measured at the frequency 1 êHz. The compositions were processed in a gas inclusion under action of an electrical field at intensity of spark-over of the gas inclusion In the fig. 1 the spectra of photoluminescence are given of compositions on the basis of 0% PVDF+30% CdS prepared at the condition of FC and SC and pure CdS. It is seen that unlike CdS, for the composition PVDF+CdS, prepared by the FC, besides of the basic maximum, two additional maxima are observed. Intensity of these maxima changes depending on the condition of preparation of compositions.

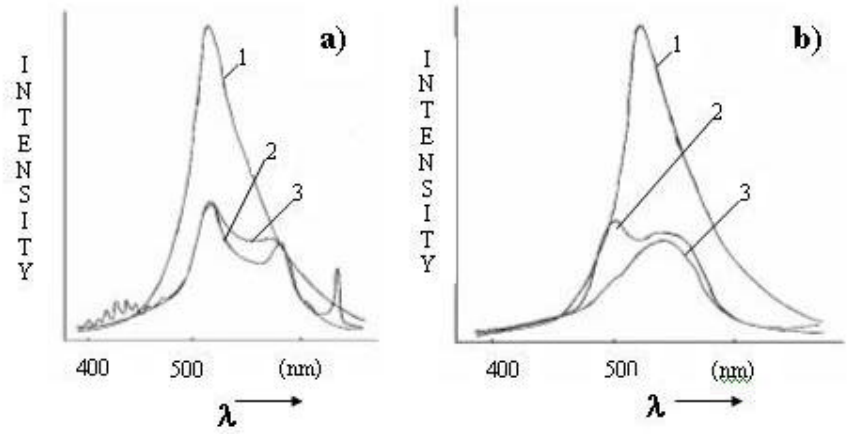

Fig.2. Spectra of photoluminescence of composites at T=293K a) 70% PVDF+30% CdS; 1. pure CdS; 2. before discharge processing; 3. after discharge processing; b) 70% PEHD + 30% CdS 1. pure CdS; 2. before discharge processing; 3. after discharge processing

In the fig. 2 the spectra of photoluminescence are given for compositions on the basis of 70% PVDF+30% CdS and 70% PEHD+30% CdS before discharge processing. It is experimentally established, that the discharge processing of compositions with various polymer matrix of strongly changes the spectra of photoluminescence, and the change of spectra for a composition 70% PVDF+30% CdS is more, than for 70% PEHD+30% CdS. Besides of the above-mentioned maxima, also a few additional small fine maxima appear.

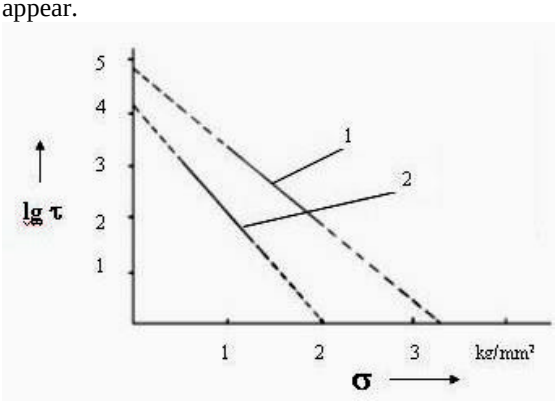

Fig.3. Temporary dependence (*lg t)* of mechanical durability for the composition 70% PVDF+30% CdS received by FC and SC at T=293K. 1. mechanical durability by FC; 2. mechanical durability by SC

Fig. 3 presents changes of temporary dependence *lgt* of mechanical durability of the composition 70% PVDF+30% CdS prepared by method of FC and SC. It is seen, from fig. 3, that such dependence is more for composition prepared by FC, than by SC. The greater value of *lg* τ of samples of FC compositions in comparison with a sample preparing by SC is explained by formation of more ordered super molecular structure of the polymer layer between particles of sulphide cadmium and by improvement of polymer œver of particles CdS in case of composition FC. In fig. 4 the dependence of dielectric constant ε, dielectrical loss-angle *tg* δ and specific volumetric resistance ρ_v for composition of 70%PVDF+30 %CdS are shown at Ò=293 Ê depending on volume contents received by method of FC and SC. It is seen, from fig.4, that with increase of the CdS concentration, the values ε, *tg* δ, *lg* t, and ρ_v vary depending on a temperature-temporary condition of crystallization.

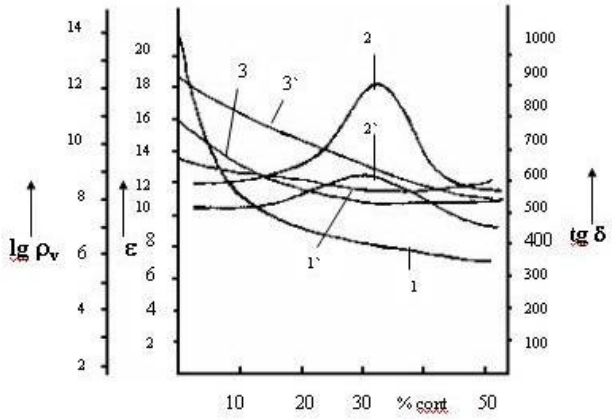

Fig.4. Dependence of dielectric constant *e*, dielectrical loss-angle *tg d* and specific volumetric resistance ρ_n compositions of 70% PVDF+30% CdS, at Ò=293Ê. 1. *e* received by FC; 2. *tg d* received by FC; 3. ρ_v received by FC; 1. *e* received by SC; 2. *tg d* received by SC; 3. ρ_v received by SC.

Thus according to above-mentioned experimental data the technology of preparation and discharge processing of composition (polymer–semiconductor) strongly influence upon the spectra of photoluminescence of compositions. Observable features in spectra of photoluminescence and values ε, *tg* δ, *lg* t, and ρ_v also are connected with change of supermolecular structure of polymers and the charging condition. It is caused by change of the degree of interaction of polymer with cadmium sulphide i.e. the process of combination of polymer with filler and excitation of new luminescent centres in single crystal CdS which strongly depend on interface interaction between components of composition.

[1] *A.A. Ismayilov, M.A. Ramazanov*. J. Power Engineering Problems, Baku, Azerbaijan, ¹3-4, 2000, p. 114-117.

[2] *A.A. Ismayilov, M.A. Ramazanov.* Photoelectric properties of composition on the basis of polymer-semiconductor *6th* International Symposium on Polymers for Advanced Technologies PAT-2001, Eilat, Israel, 2001, p. 119.

[3] A.A. Ismayilov, Ramazanov M. A. Feauteres the formation of photoluminescence spectra in composition system on the basis of polymer-semiconductor.17-th Inernational technological conference on photoelectronics and night vision devices, Moscow, Russia, May 27-31, 2002.

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