DIFFERENTIAL INDUCED ABSORPTION AT THERMORADIATION TREATMENT OF LASER PHOSPHATE GLASS CONTAINING IONS OF VARIABLE VALENCE $\left[Ce^{3+}, Ce^{4+}\right]$

F.K.Bekmuratov, A.N.Salahiddinov, N.S. Saydirasulov, G.G.Primova.
Samarkand branch Tashkent University of Information technology
E-mail: a-salaкhitdinov@yandex.ru E-mail: farrrrrrux@mail.ru

The possibility of using oxygen-containing glass as a metamaterial for quantum electronics, dosimeter of ionizing radiation and computer technology nanometric range underlines the urgency of the problem of obtaining glasses with induced negative differential absorption NIDA [1-2], called thermo-radiating effect. In the present work, carried out experimental radiation-optical studies of differential absorption spectra of neodymium phosphate laser glass composition (70-74% P_2O_5, Al_2O_3, B_2O_3, CaO, Li_2O, K_2O, La_2O_3) without and with the addition of CeO_2 by heat, radiation and thermo-radiating treatments of the samples under comparable conditions. It also examines It is considering also of the mechanisms of formation NIDA. With the aim of identifying NIDA for the source, heat-treated HT and heat-traditionally (HRT)-treated samples (HRT under simultaneous exposure to heat and radiation fields) was carried out repeating the full cycle of studies on the concentration ratio $C(n)=[CeO_2]/[Nd_2O_3]$ in the following range (PL.1):

Table №1

№ of sample	1	2	3	4	5	6	7	8	9
Contents [CeO_2]	0	0	0	0,5	1,0	1,0	2,0	2,0	2,0
Contents [Nd_2O_3]	0	4,0	8,0	4,0	1,6	6,6	2,0	4,0	4,0

Samples of glass standard sizes had a thickness of 1 mm, Irradiation, and TPO(with and without subsequent y- irradiation) was conducted at the Institude of Nuclear Physics, Akademy of Scences of Uzbekistan (Tashkent). The temperature inside a powerful channel (5-15 G/C) y-60Co source was equal (338±5) K. Selected glass convenient for TRO those that have a relatively low softening temperature (Tg ~ 653-673 K). The search for the optimal modes of treatments were carried out at temperatures close to Tg duration (t) exposure to y-field t=30,60,90 and 120 minutes.

The combination of photoluminescent and optical spectral studies in the field of 200-800 nm led the authors to the following conclusions:

-thermo-radiating conditions tantamount to increased oxidative condition, leading to:1) the interaction of glass with atmospheric ozonized oxygen atom (O_3-); 2) is the effective formation of bound electron-hole pairs (a type of hot exaction){[PO^3-]e, [PO_4^3-]e+} c cluster sizes 1-9 nm [3]; 3) efficient decomposition available in the original glass cluster structures of the type [P_2 O_7^4-] (with a size of 5-15 nm [3]) with the formation of double oxygen bridges DOB (-0-0-). As a result of leaking together thermoradiation processes observed a twofold increase the effectiveness of healing of oxygen vacancies present in the original glass (normal y-irradiation, as a rule, their number increases) switch ties double oxygen bridge scheme

[PO4] e + [≡Ce3 +] / [PO43-] e + → [PO42 -] / [≡Ce3 + (+)] / [PO42-] e +. (1)

In [1-2], it is shown that the dynamic switching structural education type [≡B-O-O*], [Fe3+-O-O*] appear with the characteristic sizes of 50-100 nm depending on conditions and doses of y-irradiation. Similar calculations based on data from [3] we found that when the dynamics of the flow of thermoradiation process (1) form 4-coordinated switching patterns [≡Nd3+-O-O-Ce3+≡] with the characteristic sizes 2-18 nm, which easily disintegrate in the subsequent y-irradiation with the hole capture. This thermo-radiating mechanism is observed in the experimental curves ΔD as the charge transfer [Ce^{3+}]↔[$Ce^{3+(+)}$]↔[Ce^{4+}], the disappearance of the Band of addition of absorption in the area of~600 nm and wavelength shift of the absorption edge on~50 nm.

Thus, TPO allows you to modify the structure LFG glasses to enhance their radiation-optical stability, to reduce the active losses of the laser elements, as well as to control their optical properties with the possibility to create multi-functional devices of computers.

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