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Abstracts

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This book contains the materials on the fundamental and applied problems of pulsed lasers. It may be interesting for researches and engineers working in the sphere of quantum electronics, spectroscopy, plasma physics, medicine, remote sensing and laser technologies.

Designed by *Kirill O. Osiev, osiev@inbox.ru*

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1. *Bagaev S.N., Osipov V.V., Kuznetsov V.L., Solomonov V.I., Shitov V.A., Maksimov R.N., Orlov A.N., and Komarskyi A.A.* / Ceramics with disordered structure of the crystal field. Rus. Phys. J. 2014. V. 56. P. 1219–1229.
2. *Tverdohleb P.E., Shchepetkin Y.A., Steinberg I.Sh. et al.* / Izmerenie energeticheskix spektrov malouglovogo rassejanija i raspredelenija opticheskix mikroneodnorodnostei lasernoi keramiki / Kvantovaja elektronika. 2014. V. 44. No. 6.

B-27

SPONTANEOUS AND STIMULATED EMISSION OF 9,10-BIS[(TRIISOPROPYLSILYL)ETHYNYL]ANTHRACENE BY PHOTO- AND ELECTROEXCITATION

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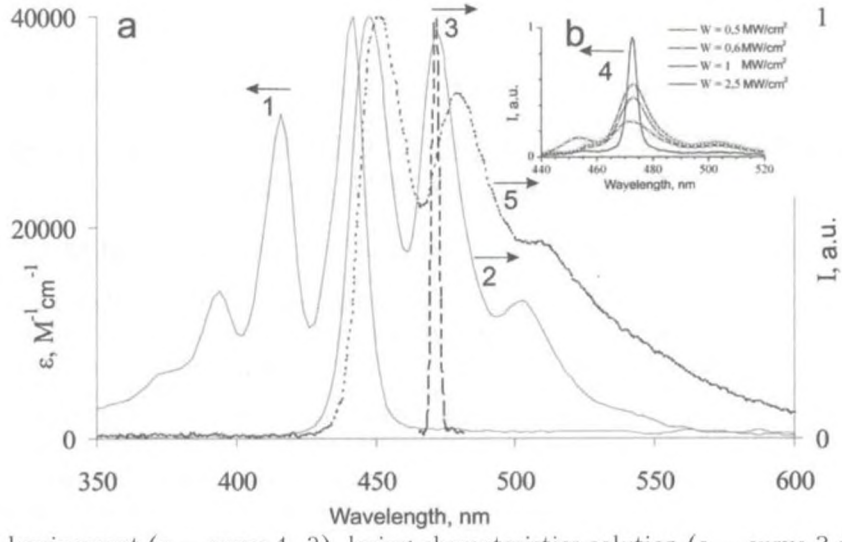
The success of organic electronics are determined by the synthesizing and investigation of organic semiconductors molecules – both low- and high-molecular weight. Substituted anthracene are perspective for organic electronics devices which can be created by different techniques (spin-coating, thermo vacuum evaporation etc.) that emit in the blue range of the spectrum [1].

The spectral-luminescent and lasing properties 9,10-Bis[(triisopropylsilyl)ethynyl]-anthracene (TIPS-A) were investigated in the solution (λ_{abs} = 394, 416, 442 nm and λ_{fl} = 448, 471, 504 nm) and in the film (λ_{abs} = 393, 415, 441 nm and λ_{fl} = 448, 475, 505 nm) (Fig.).



The spectral-luminescent (a – curve 1, 2), lasing characteristics solution (a – curve 3 and thin film (b – curve 4) and electroluminescent spectrum (a – curve 5) TIPS-A

Thin film samples were prepared by centrifugation from the PMMA solution doped TIPS-A. Quantum yield of fluorescence TIPS-A in thin film was 0.54.

Pumping was carried out by 3^{d} harmonic (355 nm) YAG-Nd^{3+} laser with transverse excitation scheme (power density was varied from 0.5 to 30 MW/cm^2). Resonator was formed by Al-reflection mirror and the wall of the cell for solutions investigation and in the film lasing was as in planar waveguide (film thickness was about 4 μm).

Lasing at λ_{las} = 471 nm with η = 9% for solution (THF 10^{-3} M) and at λ_{las} = 473 nm with η = 4% for polymer thin films were registered. It should be noted that both solution and thin film have low lasing threshold (< 1 MW/cm^2).

Electroluminescence of OLED ITO/PEDOT:PSS/PVK:TIPS-A/Ca/Al ($\lambda_{el.lum}$ = 452, 480 nm) was obtained with brightness 100 cd/m^2 at voltage 7.8 V.

The prospects of using TIPS-A for quantum and organic electronic devices are presented (thin film lasers and OLED).

1. *Karatsu T.* Blue electroluminescence of silyl substituted anthracene derivatives / T. Karatsu, R. Hazuku, M. Asuke et.al. // Organic Electronics. 2007. V. 8. P. 357–366.

B-28

PASSAGE OF RADIATION NON-CHAIN HF (DF) LASER THROUGH CRYSTALS GE

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This report presents the results of research the transmission pulsed non-chain HF (DF) laser germanium samples of varying degrees of purity, thickness and conductivity. It was investigated the influence of the geometrical parameters of the beam and the intensity distribution of radiation on the spot depending on the density of the sample transmission of the incident laser power. Duration of the laser pulse was $t1/2 = 150$ ns. It has been found that even at low intensities ($I_{las} = 0.2$ MW/cm^2) laser irradiation HF observed essentially nonlinear radiation passing through Ge. This effect is due to the absorption of non-equilibrium carriers produced in the two-photon absorption of HF laser. It was developed a computer model to calculate the radiation of HF laser passing through Ge, which adequately describes the results of experiments. Computer simulation shows that the amount of energy transmitted through the crystal Ge, strongly depends on the pulse shape and distribution of HF laser on the spot. Therefore, it is necessary to consider the real pulse shape and energy distribution on the spot for determining the coefficient of two-photon absorption in Ge.

It was shown that the germanium plate can be an effective corrector power density distribution of HF laser radiation over the cross section of the laser beam. The data obtained can be used to create effective limiters laser power range of 2.5–3.2 microns.

Nonlinear transmission DF laser radiation (range 3.6–4.1) due to three-photon process, appears at much higher irradiance ($w_{las} > 1$ J/cm^2). This work was supported by Grant from RFBR No. 15-02-06005.

B-29

EXCIPLEXES IN HIGHLY EXCITED TRIPLET STATES

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Highly excited triplet states of aromatic molecules are considered in this study. A mechanism of energy transfer from highly excited triplet aromatic molecules has been developed, which involves a stage of formation of an exciplex between a highly excited energy donor molecule and an unexcited energy acceptor molecule. Interpretation of the experimental data on the shape and the intensity of triplet–triplet absorption bands and the energy transfer probability is presented.

The results must be taken into account when considering laser media for organic compounds.

1. *Alfimov M.V., Plotnikov V.G., Smirnov V.A., Artyukhov V.Ya., and Maier G.V.* Exciplexes in Highly Excited Triplet States // High Energy Chem. 2014. V. 48. No. 3. P. 174–179.