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atomic and molecular pulsed lasers

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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

Abstracts were printed from the electronic forms presented by the authors.
environment → properties” that are useful for predicting the properties of structurally related dyes are disclosed. Developments in the field of supramolecular chemistry of dipyrrin luminophors and aspects of their practical application in the design of supramolecular structures, as laser dyes, chromophor and fluorescent sensors of metal cations, anions, polar molecules, in chelation therapy, biochemical researches and for medicinal purposes are discussed in the report.

B-16

COLLOIDAL CdTe QUANTUM DOTS PAIR FORMATION IN A QUASI-RESONANT LASER FIELD

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As we demonstrated before, quasi-resonant electrodynamical interaction of nanoparticles in a laser field can be used as instrument of forming nanostructures with pre-defined topology. Here we presented experimental results of CdTe particles pair formation. QDs pairs forming was induced by the laser pulses of 10 ns duration with the peak power 1.5 MW at 10 Hz repetition rate, molar concentration of QDs was 5 · 10⁻⁵ mole/l. Samples were irradiated at the wavelengths 540, 550, 555, 560, 565 and 570 nm. Absorption spectra of the solutions irradiated at different laser wavelengths were measured. This experimental spectra can be analyzed via assumption that it is composed from the contribution from isolated particles that remained unpaired after the irradiation, and contributions from pairs of QDs. Extraction of the isolated QDs’ spectrum allows obtaining orientation-averaged spectra of QDs’ pairs. The theoretical difference spectra obtained by fitting the interparticle distance and the percentage of QDs assembled into pairs. The percentage of QDs in pairs is 47% for 555 nm and 45% for 560 nm, the average inter-QD distance in pairs can be estimated to be 10 nm for both laser wavelengths.

B-17

INTRAMOLECULAR PHOTOPHYSICAL PROCESSES AND SPECTRAL-LUMINESCENT PROPERTIES OF THE DYE MEROCYANINE 540 AND ITS COMPLEXES WITH WATER

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Merocyanine 540 (M540) is famous dye, that used in electronics and medicine. An important feature of the dye is a significant intramolecular transfer of the electron density in the excited state. Experimentally was investigated the electronic absorption and fluorescence spectra in different solvents M540. Electronic structure, spectra and rate constants of photophysical processes of an isolated molecule and its complexes with water molecules were calculated by INDO method with spectroscopic parameterization.

Analysis of the results allowed to establish the effect of individual fragments and hydrogen bonds with water on the electronic charge transfer between the terminal units in the state S₁. Examination of photophysical processes of decomposition of the fluorescent state was showed that the intramolecular processes of decay of the S₁ state are not the cause of the differences calculated and experimental fluorescence quantum yield. Consideration of trans-cis isomerization leads to the elimination of this non-compliance.