

Application of optical technologies in biophysics and medicine

A.N. Bashkatov, A.V. Priezzhev, V.V. Tuchin

This issue of 'Quantum Electronics' presents a collection of articles reflecting the current state of the art in laser-optic technologies used in research on biophotonics and medical physics. Fast development of laser medical diagnostics and therapy is substantially due to the design of new optical technologies, means of transportation of laser radiation to the target and, also, of optical detection and imaging devices. Besides, a considerable progress in the development of nanotechnologies has enabled the researchers to obtain new earlier unavailable information about live objects and to ensure more efficient photonic effect on specific structures. Micro- and nanostructured materials open unique opportunities for biophotonics. The special issue opens with a review article by Yu.S. Skibina et al. devoted to the discussion of the specificity of the interaction of laser radiation with photonic crystalline waveguides and their application in biomedical research. In the article by A.V. Malinin et al. complementing the review, the authors describe the implementation of such hollow-core waveguides for biosensing.

Development of noninvasive techniques of imaging and quantitative evaluation of blood and/or lymph microcirculation occupy a special place in the problems of optical diagnostics. The article by Yu.L. Kuznetsov et al. is devoted to a combined application of fluorescence microscopy and the technique of dynamic scattering of light to simultaneous imaging of blood and lymph vessels. The possibilities of analysis of blood flow in the finger nail bed based on speckle-contrast technique are considered by M.A. Vilensky et al.

In optical diagnostics, the state of biotissues or cells extracted from them is usually estimated according to scattered light intensity or fluorescence spectra and lifetime

of excited states of endogenous or exogenous fluorophores. S.N. Letuta and co-authors have studied the kinetics of long luminescence of exogenous fluorophores in cells extracted from animal tissues.

Specificities of application of confocal laser microscopy technique for determining the regularities manifested at the alteration of properties of mesh prostheses of various shapes, weaving and chemical contents in the process of their splicing with organism tissues are studied in the article by V.P. Zakharov et al.

L.E. Dolotov et al. present the results of the studies of the possibilities to differentiate various regions of face skin based on the spectral measurements of diffuse reflected light in visible and near-IR ranges. This direction of research is promising from the viewpoint of monitoring the correction of face skin by means of laser technologies both at preoperative and postoperative phases.

The paper by V.I. Kochubey et al. is devoted to the study of the dependence of the luminescence spectra of the samples containing luminescent nanoparticles on the presence of the processes of scattering and reabsorption in the medium.

Improvement of the techniques of production of vaccines that are safe for the organism as a whole and, in particular, for the immune system is a problem of current interest. The article by O.V. Ulianova and co-authors presented in two parts studies the reactogenous properties of these preparations on the organism level by means of coherence-optics techniques.

Recently the analysis of fractal structures has found wide application in biology and medicine. The paper by A.S. Ulianov et al. is devoted to developing the fundamentals of express-diagnostics of the plaque pathogen with implementation of fractal analysis of speckle structures.

The article by E.S. Tuchina et al. explores the effect of IR laser radiation on the cells *Staphylococcus aureus* incubated in the solutions of indocyanine green, colloid golden nanoshells, nanocages and their conjugates with indocyanine green.

The papers presented in the special issue were discussed at the XIV Annual International Interdisciplinary School for young scientists and students on optics, laser physics and biophotonics held in Saratov (Russia) from 5th to 8th October 2010, in which over 300 specialists from 24 countries of the world took part. The editors of the issue thank all the authors and express their hope that the presented articles will be of interest to the wide readership of the journal.

A.N. Bashkatov N.G. Chernyshevsky National Research Saratov State University, Department of Optics and Biomedical Physics,
ul. Astrakhanskaya 83, 410012 Saratov, Russia; a.n.bashkatov@mail.ru;

A.V. Priezzhev Department of Physics, M.V. Lomonosov Moscow State University; International Laser Center of M.V. Lomonosov Moscow State University, Vorob'ovoy gory, 119992 Moscow, Russia;
e-mail: avp2@mail.ru;

V.V. Tuchin N.G. Chernyshevsky Saratov State University,
ul. Astrakhanskaya 83, 410012 Saratov, Russia; Institute of Precision Mechanics and Control, Russian Academy of Sciences, ul. Rabochaya 24, 410028 Saratov, Russia; e-mail: tuchinv@mail.ru

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