

Introduction to the Special Section on Laser and optical technologies in biomedicine and ecology

We are pleased to present the Special Section of the Journal of Biomedical Photonics & Engineering, which focuses on laser and optical technologies for biomedical and ecological applications. The Special Section contains the selected papers from the XV all-Russian Youth Samara conference-contest on optics and laser physics (Samara, November 14-18, 2018) in particular the papers from the Biophotonics Workshop.

The conference-contest on optics and laser physics was organized by P.N. Lebedev Physical Institute (Samara Branch) and Samara National Research University and supported by Russian Foundation for Basic Research (grant No. 17-32-10263), Administration of Samara Region and SPIE Samara Student Chapter. The Special Section of J-BPE introduces you to the major current issues of laser and optical technologies in biomedicine and ecology discussed at the Conference-contest.

The paper of **Elena M. Artemina** and co-authors is devoted to the study of normal and pathologic human skin samples using low-coherence reflectometry and scanning speckle polarimetry. The authors have demonstrated efficiency of the techniques for monitoring of pathological structural changes of human skin as well as the analysis of the influence of immersion clearing agents.

The study of **Andrey A. Leonov** and co-authors has an ecological focus. The authors proposed a new chemosensor structure for registration of metal ions contained in aqueous solutions. A hydrophilic polymer modified by a special ion-sensitive indicator is the base of the device. The presence of metal ions leads to changes in the characteristics of luminescence, providing a sensor response and allows to detect relatively low concentrations of nickel ions in water.

Knowledge of the refractive index of blood is important, for example for simulation of light distribution in the blood-saturated tissues, for diagnostic and dosimetry of that tissues. It is known that blood is extremely turbid medium with high anisotropic factor, scattering and absorption coefficients in the visible region. That's why the development of indirect techniques of determination of blood refractive indexes are actual and practically important. **Ekaterina V. Lazareva and Valery V. Tuchin** presented the technique for modelling of blood refractive indexes on the base of the measured values of refractive indexes of water solutions of haemoglobin and albumin.

Anna V. Neupokoeva and co-authors used the probe microscopy method for 3D analysis of crystallograms of biological fluids after laser impact. The authors studied the effect of laser radiation of different wavelengths and doses on the solution of the Grippoferon and the aqua solution of medical conserved bile. Those solutions were used as model media to confirm the laser effect on the size of macromolecular clusters. Not only qualitative but also quantitative changes of 3D crystallograms after laser impact can be determined using a probe microscope.

Laser hyperthermia with the use of sensitizers is the promising high sensitive technique for tumor destruction. Gold nanorods are used as sensitive agents by **Vadim M. Genin** and co-authors. They studied the heating kinetics in model tumors and surrounding skin depending on the concentration of gold nanoparticles as well as tissue vascularization. The results were directed on the optimization of the nanorods injection procedure into the tumor for its selective and effective destruction.

Development of portable diagnostic fluorimeter, proposed earlier, for detecting the advanced glycation end products in skin is presented in the paper of **Vladimir N. Grishanov** and co-authors. The authors demonstrated that measurements of the skin-scattered radiation in the visible spectral region using pulsed sources of radiation allow to reduce individual variability of the integral diagnostic parameter. Besides, some technical improvements of the fluorimeter were performed.

Thus, the papers of the Special Section demonstrate successful and promising applications of the optical and laser technologies for solution of biomedical and ecological problems.

Special Section Editors:

Aleksandra M. Mayorova, Samara Branch of P.N. Lebedev Physical Institute of Russian Academy of Sciences

Valery P. Zakharov, Samara National Research University