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Introduction

This is a collection of papers presented at the *International Symposium on Molecular Photonics* (28 June–2 July 2006, St. Petersburg, Russia) dedicated to the 110th Anniversary of Academician Alexander Terenin (1896–1967), a prominent Soviet photochemist who received worldwide recognition due to his brilliant works on the photophysics and photochemistry of organic and inorganic compounds. He was the first who introduced into scientific use the term *molecular photonics*. A distinctive feature of his research activities was a wide scope of interests in the field of molecular photonics, which we intended to reflect in the contents of this special issue of *Journal of Photochemistry and Photobiology A: Chemistry Molecular Photonics*. The most of contributors to this issue regard themselves as his disciples and followers.

The introductory paper by Prof. A. Tsyganenko gives a short biographic note and brief description of the most important results by Prof. Terenin in various fields of molecular photonics.

The section *Photonics of Inorganic Systems* is intended to present recent achievements of Terenin's followers in the photonics of heterogeneous systems. In this section, discussed are the mechanisms of interrelated processes taking place on the surface of wide band-gap oxides (Al_2O_3, TiO_2) subjected to UV/vis irradiation. It has been demonstrated that the above photocatalytic systems can be sensitized to the long-wavelength spectral range. The use of molecules and nanoparticles of Mg-phthalocyanine as photosensitizers for the Pt/SiO_2-*p*-benzoquinone system has been found to increase the quantum efficiency of photocatalytic splitting of water by an order of magnitude. In order to extend the applicability range and increase the efficiency of photocatalysis, the ZnO–C composites – for photodegradation organic pollutants and photodeactivation of bacteria – and the CdS–zeolite nanocomposites – for generation of hydrogen from water – have been synthesized and characterized. A specific influence of microwave irradiation on the photo-assisted treatment of waste waters and soil pollutions has been reported. Photochromic Ag/TiO_2-containing thin films prepared on cotton fibers were suggested for photo-controlling the antibacterial activity. A procedure for preparation of uniform Au nanoparticles in reverse micelles in the ternary and quaternary systems has been presented. The formation and stability of Au nanoparticles were found to depend on the initial concentration of compounds while the Au particle size, on the presence/absence of co-surfactants.

The section *Photonics of Organic Systems* concerns the R&D of photochromic systems for diverse applications, photopolymerizable compositions, and characterization of the fluorescent and photochemical properties of organic compounds in solution and nanoparticles. Discussed are recent advances in the applied photonics of organic photochromic systems, including recording media for optical memory, light modulators, reversible chemosensors, and photo-switchers of various destination. Reported are the data of comparative study on the photochromic behavior of naphthopyrans in solution and polymeric matrix. Attention was given to photopolymerizable compositions which find their wide application to fabrication of recording media, holographic optical elements, and protective coatings. Discussed is the formation of free radicals (as a result of photo-induced electron transfer) in different photoinitiated systems (ferric chloride, chromic acid salts, aromatic carbonyl compounds). For preparation of polymeric optical elements with high optical precision, the one-stage process of frontal photopolymerization was suggested. Based on the Terenin's ideas concerning the photonics of singlet oxygen, new results on the photosensitized phosphorescence of singlet oxygen in solution, on the photosensitized luminescence of singlet oxygen dimol and dye molecules, and on the photochemical reactions of oxygen molecules in organic solutions and water have been obtained. Aiming at synthesis of new effective laser dyes, the fluorescent and photochemical properties for a lot of selected compounds with different planarity and rigidity have been explored. Investigated was the effect of external electric field on the fluorescence of methylene-linked pyrene molecules. Investigated was the *cis–trans*-photoisomerization of some thio derivatives of 1,3-distyrenebenzene, compounds which are of interest for laser applications, as scintillators, and as photoconductive materials. A novel oxidative photodehydrocyclization of benzothiazolylphenylethenes to polycyclic heteroaromatic cations has been reported.

The section *Photonics of Biological Systems* deals with the application of light-sensitive organic compounds in biology. Perspectives for the use of light-sensitive polyaminoacids

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and polypeptides containing luminescent, photochromic and some other moieties, as the mimetics of natural proteins, have been outlined. The photochromic protein bacteriorhodopsin was used for technological realization of neural networks based on multilayer photochromic structures. With the goal of preparing photo-controlled retinals, some new photochromic dihetarylethene-containing retinal analogs have been synthesized. The properties of synthesized compounds were found to be structure-dependent.

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