

# OPTICS FOR HIGH POWER LASERS

V. Apollonov

*Prokhorov General Physics Institute RAS, Moscow, , Russia  
vapollo@kapella.gpi.ru*

## ABSTRACT

The advent of the laser has placed stringent requirements on the fabrication, performance and quality of optical elements employed within systems for most practical applications. Their high power performance is generally governed by three distinct steps, firstly the absorption of incident optical radiation (governed primarily by various absorption mechanisms); secondly, followed by a temperature increase and response governed primarily by thermal properties and finally the elements thermo-optical and thermomechanical response, e.g., distortion, stress birefringent fracture, etc. All of which needs to be understood in the design of efficient, compact, reliable and useful for many applications high power systems, under a variety of operating conditions, pulsed, continuous wave, repeated or burst mode of varying duty cycles.

## NEW TECHNOLOGIES OF MATRIX COMPOSITE POLYMER PHOTOVOLTAIC AND PHOTORESISTIVE MATERIALS

M.Kerimov, M.Kurbanov, A.Bayramov, N.Safarov, A.Gochuyeva

*Institute of Physics Azerbaijan National Academy of Sciences  
azad.bayramov@yahoo.com*

## ABSTRACT

The goal of the paper is development of more effective technology formation photovoltaic and photoresistive elements based on the polar and nonpolar polymers dispersed by CdS, ZnS, CdSe and CdTe particles. It was established that:

1. The interphase interaction in photoelectric composites on the interphase boundary is considerably depended on particle size of inorganic phase;
2. Polymer matrix is not passive phase in photoelectric composites, but defines a value of  $R_{\text{dark}}$  resistance/ $R_{\text{light}}$  resistance parameter and value of photo-emf;
3. Plasma crystallization of photoelectric composites is accompanied by formation of local levels with high concentration and activation energy in quasi-forbidden band of polymer matrix;
4. Doping of ferroelectric component with domain structure into photoelectric composite of polymer-CdS leads to increasing concentration of centers of local electric fields promoted division of photoinduced charges.

**NANOSTRUCTURES:  
INVESTIGATION OF THE SPECIAL PHYSICAL PROPERTIES**

*Continuation.*

*Beginning is in SITA-Journal v.14, no.1, 2012*

**O. Figovsky<sup>1</sup>, D. Pashin, Z. Khalitov, D. Valeeva, A. Chkanov, A. Khadiev<sup>2</sup>**

<sup>1</sup> *Polymate Ltd., International Nanotechnology Research Center, Migdal HaEmek, Israel*

<sup>2</sup> *Kazan State Technical University,*

[pashin@addnano.ru](mailto:pashin@addnano.ru)

**Contents**

4. The Peculiarities of Structure and Diffraction by Misfit Mixed-Layer Nanotubes
5. The Quantitative Theory of Diffraction by Spiral Nanotubes

**4. THE PECULIARITIES OF STRUCTURE AND DIFFRACTION BY MISFIT MIXED-LAYER  
NANOTUBES**

**ABSTRACT**

The analysis of diffraction by separate mixed-layer gophered nanotube's lattice is offered. Two extreme cases of the large and small size of coherent scattering regions (CSR) in a radial direction are considered. The qualitative explanation of observed diffraction effects is given.

**5. THE QUANTITATIVE THEORY OF DIFFRACTION BY SPIRAL NANOTUBES**

**ABSTRACT**

The quantitative theory of diffraction by spiral nanotubes of any chemical composition is offered. Distribution of diffraction intensities along layer lines and layer planes, strong and diffuse reflexes, pseudoorthogonality effect has been simulated and analyzed. The investigation is oriented to electron microdiffraction from a single nanotube.

**FRACTURE AND CRACK RESISTANCE OF SILICATE POLYMER CONCRETE**

**O. Figovsky<sup>1</sup>, D. Beilin<sup>1</sup>, Yu. Zemlyanushnov<sup>2</sup>**

<sup>1</sup> *Polymate Ltd- International Nanotechnology Research Center. Migdal HaEmek, Israel*

<sup>2</sup> *Moscow State University of Civil Engineering, Moscow, Russia*

[sital@netvision.net.il](mailto:sital@netvision.net.il)

**ABSTRACT**

The important quality of SPS's products and structures is the resistance to occurrence and development of cracks. This paper deals with experimental and theoretical study of fracture and crack resistance of SPC and is continuation and development of preceding works of authors [1,2].

## INVESTIGATION OF ULTRASONIC AND THERMAL EFFECTS' INFLUENCE ON THE SIZE DISTRIBUTION OF CARBON NANOADMIXTURES

**E.V. Korolev, A.S. Inozemtsev**

*National Research University «Moscow State University of Civil Engineering», Scientific and Educational  
Center «Nanotechnology», Moscow, Russia,  
KorolevEV@mgsu.ru*

### ABSTRACT

Results of detailed investigation of ultrasound and heat treatment of astralenes in aqueous solutions are presented. It is shown that such treatment does not lead to the required dispersion of carbon nanoadmixture: average particle size varies in the range 0.4...0.6  $\mu\text{m}$ . Volumetric content of particles with a size less than 100 nm does not exceed 15% and 5% for ultrasonic and heat treatment, respectively.

## OSCILLATION THEORY OF HETEROGENEOUS CATALYSIS AND ITS USE FOR IDENTIFICATION OF THE REACTION SCHEME AND KINETICS: CATALYTIC LIQUID-PHASE BENZENE-RING HYDROGENATION AS AN EXAMPLE

**V.E. Ostrovskii**

*Karpov Institute of Physical Chemistry, Moscow, Russia;  
vostrov@cc.nifhi.ac.ru;ostrovskii.victor@mail.ru*

### ABSTRACT

The heterogeneous-catalysis oscillation theory given earlier by us only briefly is grounded and detailed. The oscillation theory bears on the following available conclusions made in the last decades: thermally-stabilized surfaces are homogeneous, chemisorbed layers are of island structure, and the rates of chemisorption are multifold higher than the rates of catalysis. According to the oscillation theory, any surface reveals itself under stationary catalysis as a single whole rather than as a conglomerate of catalytically active centers that “work” independently of one another. The start of a reaction run, which begins from an act of chemisorption of a source molecule at one of the surface centers, leads to a shift of the gas/surface equilibrium over the entire crystal surface and to a chemical act of any other chemical nature at another surface center etc. up to desorption of a product molecule from a center distant from the first and second ones. The surfaces are covered with two-dimensional island chemadphases, each consisting of a multitude of chemadmolecules, and any catalytic process includes a rate-determining step (RDS) and a residual equilibrium portion; therewith, the knowledge of the chemical natures of the RDS and of all chemadphases, which occur at the surface, is necessary and sufficient for deduction of the kinetic equation for the process. As an example, an original reaction scheme for the heterogeneous catalytic liquid-phase benzene-ring hydrogenation in benzene-substituted substances at Ni, Pt, Pd, Ru, Ir, and Rh catalysts is proposed on the oscillation theory basis and the procedure of kinetic-equation deduction is considered. The resulted kinetic equation is capable of describing all kinetic dependences describable by the available kinetic equations and has additional possibilities.

## PHYSICOCHEMICAL PROPERTIES AFTER ACTIVATION PROCESSING IN DISINTEGRATOR

M.A. Abramov,<sup>1</sup> E.G. Stepanov<sup>2</sup>, D.V. Kachalov<sup>3</sup>, E.A. Indeikin<sup>1</sup>  
<sup>1</sup> Yaroslavl State Technical University, <sup>2</sup> Ribinsk State Aviation Technical University,  
<sup>3</sup> JSC RI "Yarsintez", Yaroslavl, Ribinsk, Russia  
*e.g.stepanov@mail.ru*

### ABSTRACT

Mechanochemical activation influence of different history hematite on its physicochemical properties was analyzed. It has been stated that mechanochemical methods permit to minimize the differences in the properties of particles surface that arise in raw materials and cause of impure ion availability.

## PHASE FORMATION IN BiTe NANOFILMS AND CRYSTALLIZATION OF Bi<sub>2</sub>Te<sub>3</sub> (Se<sub>3</sub>) NANOTHICKNESS AMORPHOUS FILM

G.M. Akhmedov  
*Institute of Physics Azerbaijan National Academy of Sciences, Baku, Azerbaijan*  
*exmedovqurban@rambler.ru*

### ABSTRACT

Phase formation processes in Bi-Te system have been investigated by kinematic electron diffraction method. It is established that Bi<sub>2</sub>Te<sub>3</sub> and BiTe phases were formed on condensation plane in amorphous and crystalline state, respectively, at simultaneous and also at consecutive evaporation of bismuth and tellurium, irrespective of the order of evaporation of components. Amorphous Bi<sub>2</sub>Te<sub>3</sub> phase is stable at room temperature and crystallizes at 423 K temperature. It is shown that ordering of BiTe phase is not a result of ordering of atom structure. Kinetic parameters of crystallization of nanothick amorphous Bi<sub>2</sub>Te<sub>3</sub>(Se<sub>3</sub>) films are determined. On experimental results it is defined that crystallization kinetics of Bi<sub>2</sub>Se<sub>3</sub> occur in accordance with Avrami-Kolmogorov law.

## NONISOCYANATE POLYURETHANES BASED ON CYCLIC CARBONATES AND NANOSTRUCTURED COMPOSITES

O. Figovsky, L. Shapovalov, A. Leykin, O. Birukova, R. Potashnikova  
*Polymate Ltd. – International Nanotechnology Research Center, Migdal HaEmek, Israel*  
*[contact@polymateltd.com](mailto:contact@polymateltd.com)*

### ABSTRACT

The article reviews production and application of the nonisocyanate polyurethanes based on cyclic carbonate oligomers. Nonisocyanate polyurethane (NIPU) networks are obtained by reaction between the polycyclic carbonate oligomers and aliphatic or cycloaliphatic polyamines with primary amino groups. This results in the formation of the crosslinked polymer with β-hydroxyurethane groups of different structure defined as polyhydroxyurethane polymer. The article discusses NIPU and hybrid NIPU (HNIPU), which contains also epoxy and acrylic compounds. Significant attention was paid to the formation of the materials based on renewable raw materials. The authors provide an overview of the recent publications in this field with a more detailed description of the Polymate Ltd. achievements.

# **RECOMMENDATIONS ON THE USE OF INFORMATION OBTAINED BY THE RADAR ORNITHOLOGICAL SYSTEM IN ISRAEL**

**L. Dinevich, Y. Leshem**

*George S. Wise Faculty of Natural Sciences, Dept. of Zoology, Tel-Aviv University, Ramat Aviv, Israel.  
dinevich@013.net*

## **ABSTRACT**

**A radar ornithological station has been created based on the meteorological radar MRL-5 and a specially designed algorithm. The system enables to plot radar charts within the radius of 60 km from the radar, combining meteorological data with vectors of birds flying at different heights, and to pass these charts online over to air traffic control operators. The data accumulated in the study made it possible to obtain certain characteristics of seasonal bird migration over Central Israel. The system and the results of the study have become an integral part of ensuring air safety for Israeli military aircraft. The radar system has made it possible, during several years, to perform regular observations and thus establish the main typical characteristics of mass inter-seasonal bird migration across Israel from Europe to Africa and back. In this work the authors present a number of recommendations on the efficient use of the system and of the information it enables to obtain.**