

JEMNÁ MECHANIKA A OPTIKA

VĚDECKO-TECHNICKÝ ČASOPIS
ROČNÍK 54 11 - 12/2009

OBSAH

OPTONIKA 2010 – veletrh optických technologií a aplikací poprvé v ČR	303
Vlnová dynamika elektronů a fotonů v jednotném rámci jednočásticové nerelativistické Schrödingerovy rovnice (J. Pospíšil, K. Šafářová).....	304
Technický boroskop - optická část zařízení na monitorování spalovacích procesů (J. Keprt, L. Pospíšil, S. Zábaj, L. Bartoněk, J. Hradil, P. Pospíšil, M. Švarc, P. Fuchs, Š. Bloch).....	308
ICO Topical meeting Emerging trends & Novel materials in Photonics (2009 Delphi Photonics) (P. Tománek).....	311
Heliový kryostat pro studium turbulentního proudění při přirozené konvekci (P. Urban).....	312
Coulombovské interakce elektronů v blízkosti Schottkyho katody (I. Liška, P. Adamec, B. Lencová).....	315
OPTA se stěhuje do většího pavilonu (M. Střítecký).....	318
EOS Annual Meeting 2009 (M. Jedlička, P. Tománek).....	319
Moderní technologie ve studiu aplikované fyziky na Přírodovědecké fakultě Univerzity Palackého v Olomouci (R. Kubínek, P. Horváth).....	320
Hodnocení strukturních změn v epoxidové pryskyřici sledováním vnitřního tlumení (D. Kroisová).....	322
V Rusku se připravuje ke startu Industrial Trade Fair Moscow (B. Mahnken).....	324
Měření drsnosti obroběných ploch optickou metodou založenou na fázové vizualizaci (J. Valíček, M. Držík, P. Hlaváček, M. Kušnerová).....	325
Uplatnění simulačního systému v procese experimentálního merania (R. Krehel, J. Dobránský).....	329
EMO MILANO 2009 (J. Kůr).....	332
Problematika využití biopaliv pro aplikace ve vznětových motorech a jejich emisní analýza (V. Hönig, J. Hromádko, J. Hromádko).....	333
„Virtuální násobič pixelů“ zvyšuje rozlišení (P. Pavlíček).....	338

Bližší informace o poslání časopisu, pokyny pro autory, obsah časopisu apod. je uveden na internetu:
<http://www.fzu.cz/struktura/casopisy/jemnam/jemname.php>

Informace o předplatném podá, objednávky přijímá, objednávky do zahraničí vyřizuje: SLO UP a FZÚ AV ČR, Tř. 17. listopadu 50, 772 07 Olomouc, tel.: 585 631 576, fax: 585 631 531.

Cena čísla 80 Kč včetně DPH

FINE MECHANICS AND OPTICS

SCIENTIFIC-TECHNICAL JOURNAL
VOLUME 54 11 - 12/2009

CONTENTS

OPTONIKA 2010 – trade-fair of optical technologies and their applications for the first time in the Czech Republic	303
Wave dynamics of electrons and photons under unified framework of the one-particle nonrelativistic Schrödinger equation (J. Pospíšil, K. Šafářová).....	304
Technical boroscope – optical part of the device for combustion processes monitoring (J. Keprt, L. Pospíšil, S. Zábaj, L. Bartoněk, J. Hradil, P. Pospíšil, M. Švarc, P. Fuchs, Š. Bloch).....	308
ICO Topical meeting Emerging trends & Novel materials in Photonics (2009 Delphi Photonics) (P. Tománek).....	311
Helium cryostat for experimental study of natural turbulent convection (P. Urban).....	312
Coulomb interactions of electrons in the vicinity of the Schottky source (I. Liška, P. Adamec, B. Lencová).....	315
OPTA moving in the larger fair pavillon (M. Střítecký).....	318
EOS Annual Meeting 2009 (M. Jedlička, P. Tománek).....	319
New technologies in applied physics at Faculty of Science of Palacký University in Olomouc (R. Kubínek, P. Horváth).....	320
An Internal Damping Observation as a Method of Characterization Epoxy Resin Structure Changes (D. Kroisová).....	322
Industrial TradeFair Moscow gets ready for launch in Russia (B. Mahnken).....	324
Roughness Measurement of the Machined Areas by Optical Method Based on Phase Visualization (J. Valíček, M. Držík, P. Hlaváček, M. Kušnerová).....	325
Application of simulation system in the experimental measurement process (R. Krehel, J. Dobránský).....	329
EMO MILANO 2009 (J. Kůr).....	332
Problems of biofuels usage in applications for diesel engines and their emission analysis (V. Hönig, J. Hromádko, J. Hromádko).....	333
“Virtual pixels multiplier” can improve the resolution (P. Pavlíček).....	338

For further information about the journal intention, instructions for authors, contents etc. please refer to
<http://www.fzu.cz/struktura/casopisy/jemname.php>

Information on subscription rate and on ordering gives the SLO UP a FZÚ AV ČR, Tř. 17. listopadu 50, 772 07 Olomouc, tel.: 585 631 576, fax: 585 631 531.

Price for single copy: 80 Kč incl. VAT

CONTENTS

OPTONIKA 2010 – trade-fair of optical technologies and their applications for the first time in the Czech Republic 303

In view of intensive development of optical technologies witnessed daily in the many industrial sectors, the fair management of Terinvest spol. s r.o. decided to include a new international trade fair of optical technologies and their applications – OPTONIKA 2010 in its fair spring calendar. This project so far with no parallel in the Czech Republic will be held at the same time with traditional 18th international trade fair of electric engineering and electronics.

Wave dynamics of electrons and photons under unified framework of the one-particle nonrelativistic Schrödinger equation (J. Pospíšil, K. Šafářová)..... 304

Some analogical forms of the one-particle nonrelativistic three-dimensional time-nonstationary and stationary Schrödinger quantum equation for conductive electrons and photons in adequate homogeneous or nonhomogeneous and isotropic material media are presented in the article. Their interpretation and comparison enable considerations about the conditions for a direct transit of some mutually relevant characteristic quantities and functions.

Technical boroscope – optical part of the device for combustion processes monitoring (J. Keprt, L. Pospíšil, S. Záboj, L. Bartoněk, J. Hradil, P. Pospíšil, M. Švarc, P. Fuchs, Š. Bloch) 308

This paper is an extension of the work Optical System of Boroscope I [1]. It describes the scheme of a mechanical tube construction, the boroscope head with an iris diaphragm and the end imaging optical member. A colour CCD camera connected with the boroscope head using a bellows transfer electronic signals of the compound flame image to the PC monitor. The monitored three coloured (red, green, blue) images and their intensities give more information about the flame quality, so that it is possible to achieve more efficient and eco-friendly combustion processes.

Key words: Boroscope, mechanic-optical system, tube, boroscope head, coloured CCD camera, spectral components of flame image, combustion process

ICO Topical meeting Emerging trends & Novel materials in Photonics (2009 Delphi Photonics) (P. Tománek)..... 311

Helium cryostat for experimental study of natural turbulent convection (P. Urban)..... 312

This paper describes a helium cryostat with an experimental cell for the study of the natural turbulent convection at very high Rayleigh numbers ($10^6 < Ra < 10^{15}$) with cryogenic ^4He gas (from 4.2 K to 8 K) as working fluid. The cylindrical convection cell of 300 mm in diameter and up to 300 mm in height is assembled from central, top and bottom parts. The parts are jointed by flanges which are sealed by indium wires. The central part is exchangeable and allows modification of the geometry of the cell. The cell is designed for measurement at pressures from 100 Pa to 250 kPa. The cell design minimises the parasitic heat flux into the fluid.

Coulomb interactions of electrons in the vicinity of the Schottky source (I. Liška, P. Adamec, B. Lencová) 315

The paper describes simulation method for the evaluation of Coulomb interactions on energy spread in electron beam in the vicinity of Schottky emission source. It presents also some preliminary results of performed Monte Carlo simulations.

OPTA moving in the larger fair pavillon (M. Strítěcký)..... 318

EOS Annual Meeting 2009 (M. Jedlička, P. Tománek)..... 319

New technologies in applied physics at Faculty of Science of Palacký University in Olomouc (R. Kubínek, P. Horváth) ... 320

An Internal Damping Observation as a Method of Characterization Epoxy Resin Structure Changes (D. Kroisová) 322

Epoxy resins are polymer materials reaching their final mechanical parameters after creating unchangeable inner structure. Time 48 hour and temperature 25°C are considered to be sufficient for the final mechanical parameters achievement. But the final structure creating lasts longer. An internal damping observation can be suitable for the purpose of material changes characterization.

Key words: internal damping, epoxy resin

Industrial TradeFair Moscow gets ready for launch in Russia (B. Mahnken) 324

Roughness Measurement of the Machined Areas by Optical Method Based on Phase Visualization (J. Valíček, M. Držík, P. Hlaváček, M. Kušnerová) 325

The contribution is devoted to the design, development and basic results of contactless optical method application designed for measuring the roughness of machined areas. The method allows analysis of the surface spectrum of illuminated laser beam through defocusing optical transformation. The obtained results point to a very good correlation between the measured parameters of machined surfaces and standard values.

Application of simulation system in the experimental measurement process (R. Krehel, J. Dobránský)..... 329

EMO MILANO 2009 (J. Kür)..... 332

Problems of biofuels usage in applications for diesel engines and their emission analysis

(V. Höning, J. Hromádka, J. Hromádka) 333

The article describes diesel engines drive design solved by a support of plant oil-based fuels (RME, rape oil). It provides alternative instead of standard engine diesel fuel. Properties of above mentioned bio-fuels are listed in the article and their possible use in combustion engines applications and it takes into account a design modification of fuel set or combustion chamber. Last but not least it pays an attention to possible negative impact on machine service ability and possibilities of these impacts' decreasing. The experimental part of paper analyses an emission production and fuel consumption in comparison with diesel engine fuel by computer simulation of engine testing cycle. (NRTC, Non-Road Transient cycle) that serves to off-road vehicles homologation.

Key words: RME, rape oil, emission, design modification, NRTC cycle

“Virtual pixels multiplier” can improve the resolution

(P. Pavlíček) 338

Camera systems or scanners are expected to demonstrate their high resolution. Among typical examples we can count automatic systems for recognition or monitoring, pictures for cartographic purposes or medical microimages. To meet rising requirements is not easy, especially when the price of the device has to stick reasonable limits. The possible solution is so called pixel sub-stepping. Using this virtual pixel multiplier it is possible to improve the resolution of all recording systems and therefore significantly also picture quality. The piezoelectric shifting in these systems plays a crucial role.