WELCOME TO INDLAS 2014

The conference ”INDLAS 2014” is the fourth one in a series of international conferences dedicated to modern laser applications organized in Romania since 2007. The topics of this conference include lasers in materials science and processing, nonlinear photonics, optoelectronics and optical components, “Extreme Light Infrastructure – Nuclear Physics” (ELI – NP) & “Center for Advanced Laser Technologies” (CETAL) projects and related activities, laser metrology and testing, lasers in environment and life sciences, physics of plasma sources and applications, plasma & lasers industrial applications.

The aim of this international conference is to provide a good opportunity for the researchers working in the fields of lasers / plasma applications, including industrial lasers, to discuss their newest results, to share experience, to stimulate interdisciplinary research and the partnerships in the European Networks integrated in HORIZON 2020.

The position of our country, Romania, in the Central-Eastern Europe can play an important role in the promotion of the scientific cooperation in this region, in order to increase its role in the European Research Area. Since 2008 the National Institute for Laser, Plasma and Radiation Physics (INFLPR) had won / participated in a number of very important international projects, as LASERLAB, ELI-Preparatory Phase, ELI – NP. We specially mention the CETAL facility of the INFLPR that includes the first PW laser in Romania, which will be functional in the mid of this year.

The organization of “INDLAS 2014” was possible by the action and support of several national and international institutions. We mention INFLPR, APELLASER SRL, INFLPR – OSA Student Chapter. Thanks are due to the co-sponsoring organizations and companies to the success of the conference: Romanian Association of Photonics (ARFO), TEHNOOPTOELECTRONICA S.A., Coherent, ProtoFlex Corporation U.S.A. and Foundation for Democracy, Culture and Liberty (FDCI).

By the efforts of the Scientific Committee, 77 scientific papers of authors from 7 countries have been selected for presentation at “INDLAS 2014”, in 16 invited lectures, 15 oral presentations and 46 posters. We express our gratitude to the invited professors and to all participants for their high level work.

We would like to express our thanks to the members of the Scientific Committee and the Organizing Committee of “INDLAS 2014”, for their work. We thank to the Directors of the INFLPR Dr. Ion Morjan and Dr. Traian Dascalu, and to the Head of the Laser Department, Dr. Viorica Stancalie. Thanks to Drd. Petronela Gheorghe, Dr. Silviu T. Popescu, Mariana Buzatu, Dr. Laura Mihai, Gabriela Stan, Cristian Stan for their work for the Conference.

Finally, we hope that the participants in “INDLAS 2014” will enjoy the scientific sessions and the Carpathian Mountains, will make new friends and will strengthen their scientific collaboration.

Dr. M. Udrea, Dr. A. Petris, Dr. V. R. Medianu

CONFERENCE PROGRAM

Date	*Time*	*Conference Hall (within the Theater Hall)*
May 19, Monday	16.00 – 18.00	**Registration**
	18.30	***Get Together Party (Club Vila Bran Restaurant)***
May 20, Tuesday	09.00 – 09.15	**Opening session**
		Session 1
		Chair: Victor Rares Medianu
	09.15 – 10.00	**I 1.** **Mauro Pereira** Microscopic Theory of Semiconductor Lasers and Applications to THz and Mid Infrared (TERA-MIR) Spectroscopy
	10.00 – 10.45	**I 2.** **Paul Harten** Novel laser technologies for smooth and uniform metal surface treatment
	10.45 – 11.00	***Coffee Break***
		Session 2
		Chair: Mauro Pereira
	11.00 – 11.45	**I 3.** **Razvan Dabu** Architecture of high power femtosecond lasers
	11.45 – 12.30	**I 4.** **Ioan Dancus** CETAL 1PW laser system status and laser developments roadmap for ELI-NP
	12.30 – 14.30	***Lunch***
		Session 3
		Chair: Valentin Craciun
	14.30 – 15.15	**I 5.** **Dragos Seuleanu** and **Ioan Ursu** Scientific Research - Innovation - Clusters: The new highway for reindustrialization of the EU
	15.15 – 16.00	**I 6.** **Maria Dinescu** Laser material printing for sensors applications
	16.00 – 16.15	**O 1.** **Justyna Chrzanowska** Investigation of Wavelength Influence on Rhenium Diboride Films Prepared by PLD Method
	16.15 – 16.30	***Coffee Break***
		Session 4
		Chair: Maria Dinescu

Date	*Time*	*Conference Hall (within the Theater Hall)*
	16.30 – 17.15	**I 7.** **Adrian Petris** Light Guiding Light in Lithium Niobate
	17.15 – 18.00	**I 8.** **Aurelian Popescu** Turning Laser Diodes into Tunable Light Sources for High Resolving Power Spectroscopy
	18.00 – 18:15	**O2.** **Radu F. Stancu** Akinetic optical swept source for OCT applications
	18.15 – 18:30	**O 3.** **Mihai Oane** Two temperature model for metals: a new "radical" approach: theory versus experiment
May 21, Wednesday		**Session 5**
		Chair: Mihail Dumitrescu
	09.00 – 09.45	**I 9.** **Axel Wehling** Emerging Laser Design for demanding Ultrafast Applications
	09.45 – 10.30	**I 10.** **Valentin Craciun** Pulsed laser deposition of transitional metals carbide, nitride and carbo-nitride hard coatings: chemistry, structure and mechanical properties
	10:30 – 10.45	**O 4.** **Silviu T. Popescu** Interferometric measurement of light induced refractive index changes
	10.45 – 11.00	***Coffee Break***
		Session 6
		Chair: Razvan Dabu
	11.00 – 11.45	**I 11.** **Joerg Hermann** Modelling of Plasma Emission Spectra for Quantitative Elemental Analysis via Laser-Induced Breakdown Spectroscopy
	11.45 – 12.30	**I 12.** **Hubertus von Bergmann** High pressure CO_2 amplifiers for short pulse amplification
	12.30 – 14.30	***Lunch***
		Session 7
		Chair: Adrian Petris
	14.30 – 15.15	**I 13.** **Mihail Dumitrescu** Semiconductor laser diodes with laterally-coupled ridge-waveguide surface gratings
	15.15 – 16.00	**I 14.** **Marian Zamfirescu** Dynamics of laser irradiated surfaces at picosecond time scale

Date	*Time*	*Conference Hall (within the Theater Hall)*
	16.00 – 16.15	**O 5.** **Anita Visan** Matrix Assisted Pulsed Laser Evaporation synthesis of biomimetic nanocrystalline apatite coatings with applications in medicine
	16.15 –18.15	***Poster Session and Coffee Break***
May 22, Thursday		**Session 8**
		Chair: Paul Harten
	09.00 – 9.45	**I 15.** **Mihai Lucian Pascu** The use of nonantibiotics modified by exposure to laser radiation to fight multiple drug resistance
	9.45 – 10.30	**I 16.** **Mihai Ganciu** Prospects of Space Radiation Environment Simulation by Using High Power Laser Infrastructures
	10.30 – 10.45	**O 6.** **Bogdan Mihalcea** Prospects towards an optical system for trapping and cooling of $^{138}Ba^{+}$ ions at CETAL
	10.45 – 11.00	***Coffee break***
		Session 9
		Chair: Mircea Udrea
	11.00 – 11.15	**O7.** **Mihai Selagea** Industrial Laser Applications in Romania
	11.15 – 11.30	**O8.** **Zygmunt Mucha** Analytic model for laser welding with deep penetration
	11.30 – 11.45	**O 9.** **Mulczyk Krystian** Laser cutting of steel cables used to manufacture pull rods in the automotive industry
	11.45 – 12.00	**O 10.** **Kurp Piotr** Thin-walled titanium's alloy tubes circumferential welding by Nd:YAG compared CO_2 laser via theoretical conductive welding model
	12.00 – 12.15	**O 11.** **Tatiana Alexandru** Laser photodecomposition of phenothiazine derivative
	12.15 – 12.30	**O 12.** **Mihai Boni** Study of the dynamic effects at the laser beam – pendant droplet interaction
	12.30 – 12.45	**O 13.** **Adriana Smarandache** Spectroscopic studies of unexplored imidazolidines in view of their DNA binding affinity characterization

Date	*Time*	*Conference Hall (within the Theater Hall)*
	12.45 – 13.00	**O 14.** **Lucica Boroica** New boro-phosphate glasses for optoelectronics and photonics
	13.00 – 13.15	**O 15.** **Daniela Dogaru** Study of low clouds radiative forcing using MODTRAN 4 model
	13.15– 15.00	***Lunch***
	15.00 – 19.30	***Free activities***
	19.30	***Collegial Dinner (Club Vila Bran Restaurant)***
May 23, Friday	09.00 – 10.00	Round Table of the Romanian Photonics Association (ARFO)
	10.00 – 11.00	**Discussions and Closing Session**

INVITED PRESENTATIONS

I 1. TERA-MIR Radiation: Materials, Generation, Detection and Applications

M.F. Pereira

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In this talk, I start by summarizing the main goals and recent achievements of COST ACTION MP1204 [1]. It's main objective of this action is to advance novel materials, concepts and device designs for generating and detecting THz and Mid Infrared radiation using semiconductor, superconductor, metamaterials and lasers and to beneficially exploit their common aspects within a synergetic approach. We use the unique networking and capacity-building capabilities provided by the COST framework to unify these two spectral domains from their common aspects of sources, detectors, materials and applications. We are creating a platform to investigate interdisciplinary topics in Physics, Electrical Engineering and Technology, Applied Chemistry, Materials Sciences and Biology and Radio Astronomy. The main emphasis is on new fundamental material properties, concepts and device designs that are likely to open the way to new products or to the exploitation of new technologies in the fields of sensing, healthcare, biology, and industrial applications. End users are: research centres, academic, well-established and start-up Companies and hospitals. In the second part of the talk and introductory lecture will be delivered to help explain the underlying theory.

In the second part of my presentation, I summarize my own progress in four different topics of modeling materials for this range. I start with effective three dimensional anisotropic materials with new expressions for the nonlinear absorption, gain and luminescence of semiconductor superlattices described as anisotropic media. Next the superlattices are fully described in the case of Quantum Cascade Lasers (QCLs) and preliminary results of a cooperation between two teams of COST MP1204, which will lead to the new state of the art QCL simulators are outlined. Soutions for intersubband lasing without inversion using dilute nitride materials are also discussed. The final part of the talk is dedicated to the coupling of light in a microcavity with intersubband excitations considering both intervalence THz transitions [2] and dispersive gain in dilute nitrides. The theoretical results outlined are intended to stimulate further cooperation between theory and experimental teams and to support Round Robin activities.

References

M.F. Pereira, TERA-MIR radiation: materials, generation, detection and applications, Opt Quant Electron, 46, pp. 491–493 (2014).

M. F. Pereira Jr. and I.A. Faragai, Coupling of THz radiation with intervalence band transitions in microcavities Optics Express, Vol. 22 Issue 3, pp.3439-3446 (2014).

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I 2. Novel laser technologies for smooth and uniform metal surface treatment

Paul Harten

Managing Director LILAS GmbH and LIMO Lissotschenko Mikrooptik GmbH, Dortmund, Germany

Laser processing of metal surfaces has been studied for many decades. The arrival of affordable kilowatt laser power has brought laser treatment of metal surfaces from the stage of scientific experiments straight to the stage of economically attractive industrial production.

The author's companies have pioneered new laser treatment technologies making use of very simple widely available high powered laser sources.

These new technologies pioneered by the author's companies have demonstrated stunning results in terms of exceptional surface properties.

This presentation focuses on processing results of two specific new technologies:

1. Thin (several 100 micrometer layer) metallurgically bonded smooth hard metal coatings on steel in co-operation with customer Abakan Inc., Miami, Florida, USA.
2. Thick (several millimeter layer) smooth laser cladding of hard metal on steel in co-operation with customer Baumann Institute, Moscow, Russia.

I 3. Architecture of high power femtosecond lasers

Razvan Dabu

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High power femtosecond laser systems are based on Kerr-lens mode-locked femtosecond oscillators and chirped pulse amplification (CPA) technique. Key element of CPA is the matched stretcher-compressor configuration. Basic architecture of Ti:sapphire CPA laser systems including regenerative and multi-pass amplifiers is described. Optical parametric chirped pulse amplification (OPCPA) can be considered as an alternative to CPA. By combining low energy OPCPA with high energy Ti:sapphire amplification and by use of advanced techniques for spectral bandwidth control, intensity contrast improvement, and wavefront correction, sub-25 fs pulse-width PW-class lasers are in progress. 10^{22}-10^{23} W/cm^2 laser intensity is expected in tightly focused beams.

I 4. CETAL 1PW laser system status and laser developments roadmap for ELI-NP

Ioan Dancus[1,2], Daniel Ursescu[1,2], Liviu Neagu[1,2], Mihail Cernaianu[2], Theodor Asavei[2], Aurelian Marcu[1], Florin Jipa[1], Ionut Nicolae[1], Gabriel Cojocaru[1], Romeo Banici[1], Razvan Ungureanu[1], Razvan Dabu[1,2], Catalin Ticos[1], Mihai Ganciu[1], Constantin Grigoriu[1], Ion Morjan[1,2], Sydney Gales[2], Victor Zamfir[2]

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[2]Extreme Light Infrastructure-Nuclear Physics, IFIN-HH, Bucharest-Magurele, Romania

The status of the CETAL 1PW laser system will be presented. The methods for measurement and the parameters obtained during the commissioning of the laser system will be discussed. The schedule for the commissioning of the complete laser system will be updated with emphasis on the beam transport line, the control system and the laser safety system. The ELI-NP facility will be briefly presented. The roadmap of the experiments that will be performed at CETAL for the ELI-NP laser beam transport systems will be sketched.

I 5. Scientific Research - Innovation - Clusters: The new highway for reindustrialization of the EU

Dragos Seuleanu and **Ioan Ursu**
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I 6. Laser material printing for sensors applications

Alexandra Palla-Papavlu*, Thomas Lippert**, **Maria Dinescu***

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** PSI Villigen, 5232, Villigen, Switzerland

Precise positioning of different active compounds with micro and even nano scale resolution over large areas is the main demand in the development of next generation research applications such as sensors and microarray chip devices.

Laser-induced forward transfer (LIFT) has emerged as a powerful technique for printing a wide range of materials in solid or liquid phase.

The objective of this work is the application of LIFT for the fabrication of different sensor arrays. The active materials placed by LIFT are either single walled carbon nanotubes (SWCNT) or polymers. First the process parameters for printing functional pixels onto sensor structures are investigated. Second, the sensor arrays are characterized in terms of their sensing characteristics, i.e. sensing of different volatile organic compounds proving the feasibility of LIFT for the fabrication of sensor arrays.

I 7. Light guiding light in lithium niobate

Adrian Petris, Silviu T. Popescu**,** Valentin I. Vlad

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A short review of the results obtained by the authors in the field of soliton waveguides induced by bright spatial solitons in lithium niobate is presented. The significant improvements achieved in soliton waveguide recording by using blue – violet light and pyroelectric effect, compared to the recording with green light and a high external electric field, are discussed. The potential applications of soliton waveguides recorded in lithium niobate for passive and active functionalities in 3D integrated photonics are briefly described.

I 8. Turning Laser Diodes into Tunable Light Sources for High Resolving Power Spectroscopy

Aurelian Popescu

National Institute for Research and Development in Optoelectronics, Magurele-Romania

Spectroscopy is a widespread branch used for materials characterization. Specific methods can be used when we have to do spectral measurements with high resolution. The application of tunable lasers is a convenient approach. However, the common laser systems are quite expensive. In the current report it is examined a cheaper method to provide spectral measurements with high resolution based on usual diode laser. In combination with a laboratory monochromator the laser is turn into tunable narrowband light source. Our own results of recording the Neon gas spectra are presented.

I 9. Emerging Laser Design for demanding Ultrafast Applications

Axel Wehling

Coherent GmbH, Dieselstr. 5b, Germany

I 10*. Pulsed laser deposition of transitional metals carbide, nitride and carbo-nitride hard coatings: chemistry, structure and mechanical properties

G. Socol[1], D. Craciun[1], G. Dorcioman[1], N. Stefan[1], M. Hanna[2], C. R. Taylor[2], D. Cristea[3], M. Stoicanescu[3], D. Pantelica[4], P. Ionescu[4], N. Becherescu[5], C. Martin[6], E. Lambers[7], N. Argiby[8], and **V. Craciun**[1]

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Transitional metal carbides and nitrides are a special class of materials that combine ceramic properties (high melting temperature, hardness, thermochemical stability) with metallic characteristics (good thermal and electrical conductivity), which have been used in microelectronics, nuclear engineering, space exploration, or biocompatible coatings applications. They crystallize in the face-centered cubic system, which allows for wide ranges of the metal to anion ratio with important effects on the structure, oxygen impurity and strain levels. Our research tries to understand the link between the composition and structure and the properties of these coatings and based on the results to design better ones.

I 11*. Modelling of Plasma Emission Spectra for Quantitative Elemental Analysis via Laser-Induced Breakdown Spectroscopy

J. Hermann

Aix-Marseille University / CNRS, LP3

Material analyses via laser-induced breakdown spectroscopy (LIBS) often suffer low measurement precision. They remain qualitative or semi-quantitative in many situations, in particular, when organic materials are investigated. This main drawback of LIBS analyses is due to difficulties of calibrating the measurements. Indeed, LIBS analyses have to be calibrated with standard samples having elemental compositions close to that of the sample to be analyzed. To overcome these difficulties, calibration-free LIBS measurement procedures have been developed. Based on modelling of the laser-produced plasma, the elemental composition is obtained by comparing the measured optical emission to the calculated plasma emission spectrum.

The development of the appropriate plasma model is a particularly difficult task, as laser-produced plasmas are characterized by a complex expansion process into the surrounding atmosphere. Several experimental investigations show that the plasma temperature and density profiles are spatially nonuniform [1, 2]. The gradients remain up to time delays typically applied in LIBS experiments. The nonuniformity may be ignored when the analysis only deals with plasma species of similar excitation and ionization energies. Contrarily, the gradients have to be considered if species of significantly

different excitation energies are involved, as these species are located in zones of different temperature [3].

In the present paper, we discuss the possibilities of performing LIBS analysis via plasma modelling by considering the nonuniform character of the laser-produced plasma. In particular, we present an approach based on the calculation of the spectral radiance that takes advantage of the analysis of the spectral line shapes as a feedback in the LIBS measurement procedure [4].

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I 12. High pressure CO_2 amplifiers for short pulse amplification

Hubertus von Bergmann[1,2] and Francois Morkel[1]

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Results obtained from a small discharge cross section (10×10 mm) high pressure (10 bar) TE CO_2 laser are presented demonstrating its broad gain bandwidth and suitability for picoseconds pulse amplification. Output parameters of the laser such as gain profile between laser lines, temporal pulse profile and peak pulse power as well as stability of the laser output over long periods of operation are demonstrated. Preliminary results will be presented of a discharge system scaled to larger discharge cross sections (50×80 mm) intended for high pressure amplifiers in ultra short pulse terawatt laser systems. The system has been operated at gas pressures of up to 3.0 bar with various CO_2 laser gas mixtures. Discharge stability studies and gain measurements will be reported.

I 13. Semiconductor laser diodes with laterally-coupled ridge-waveguide surface gratings

M. Dumitrescu, A. Laakso, J. Viheriala, H. Virtanen, T. Uusitalo

Optoelectronics Research Centre, Tampere University of Technology

The conventional distributed feedback (DFB) edge-emitting lasers with buried gratings require two or more epitaxial growth steps. To avoid the problematic overgrowth we have used laterally-coupled ridge-waveguide (LC-RWG) surface gratings, which enable easy integration in complex device structures and are applicable to different materials, including Al-containing ones. The paper presents the LC-RWG grating particularities, their modeling and design, the fabrication process, involving a highly productive and cost-effective UV-nanoimprint lithography, and the characteristics obtained for several applications including narrow-linewidth lasers for atomic clocks and sensing; dual-wavelength emission for radio-over-fiber and THz generation and photo-photon resonance enhanced high-speed optical communication.

I 14. Dynamics of laser irradiated surfaces at picoseconds time scale

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Laser induces nanostructures on metallic surfaces are investigated by pump-probe experiment. A single near-infrared femtosecond laser pulse, the pump beam, irradiates the materials surface and produces near the ablation threshold self-organized laser induced nanostructures. A second UV beam, the probe beam, investigates the laser modified surface. The reflected, diffracted and scattered signals are recorded at different time delays. Therefore, the melting time, re-solidification time, the build-up time of quasi-periodical nanostructures are revealed in the range of tens to hundreds of picoseconds.

I 15. THE USE OF NONANTIBIOTICS MODIFIED BY EXPOSURE TO LASER RADIATION TO FIGHT MULTIPLE DRUG RESISTANCE

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The behaviour of microdroplets that contain solutions of medicines in distilled/ultrapure water was recorded at high speed, at resonant interaction with laser pulses in the medium range of beam power. The produced effect of laser induced fluorescence depends of fluorophore concentration and of pumping conditions. The laser beam energy at a given fluorophore concentration may allow to control the dimensions/intensities of the mechanical effects on the droplets and the fluorescence emission characteristics. The studied medicines are nonantibiotics in the phenothiazines class with the direct application in fighting the Multiple Drug Resistance developed by gram-positive bacteria at treatments with standard antibiotics.

Acknowledgements: This work was supported by the Romanian ANCS/CNDI–UEFISCDI program, projects PN-II-ID-PCE-2011-3-0922 and PN-II-PT-PCCA-2011-3.1-1350, and NUCLEU program, project LAPLAS 3- PN09 33.

I 16. Prospects of Space Radiation Environment Simulation by Using High Power Laser Infrastructures

M. Ganciu, B. Mihalcea, C. Diplasu, A. Groza, O. Stoican, A. Surmeian, C. Ticos, O. Marghitu, B. Cramariuc and R. Vasilache

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ORAL PRESENTATIONS

O 1. Investigation of Wavelength Influence on Rhenium Diboride Films Prepared by PLD Method

J. Chrzanowska[1], J. Hoffman[1], M. Giżyński[2], T. Mościcki[1]

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[2]Faculty of Material Science and Engineering of Warsaw University of Technology
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In answer to research interest in production of super hard coatings prepared by pulsed laser deposition (PLD) method, Rhenium Diboride was taken under consideration. PLD is characteristic by necessity to define deposition parameters best for particular substance. ReB_2 coatings were prepared with the use of 355 nm and 1064 nm wavelengths of Nd:YAG laser and the influence of laser wavelength on those films preparation was investigated. Deposition efficiency increased with shorter wavelength, however layer's smoothness was better for longer wavelength. The XRD analysis shows crystalline ReB_2 character of achieved samples.

O 2. Akinetic optical swept source for OCT applications

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The current trend in swept source (SS) based optical coherence tomography (OCT) is to increase its axial range, by achieving coherence lengths longer than 1 cm. However, such SSs are expensive, and they rely on mechanical devices, susceptible to electrical shocks, like polygon mirrors, Fabry Perot filters or MEMS. Also, they do not serve all range of OCT applications. Our group developed a versatile electronically controlled SS, with adjustable linewidth to be used in conjunction with novel OCT configurations that do not necessarily need narrow linewidths. The principle involved is that of mode locking a dispersive cavity laser cavity and changing the frequency of the signal injecting the mode-locking [1, 2]. The linewidth is controlled by varying the mode locking frequency. Such a source is ideal for several OCT applications developed in our group, for which it would be inefficient to employ a high cost, long axial range SS [3, 4]. The sweeping achieved could be up to 20 kHz (limited by the RF generator) and the bandwidth varied between 30 – 50 nm depending on the sweeping speed, the larger the speed, the smaller the tuning bandwidth. Using an amplifier, the power was increased up to over 10 mW.

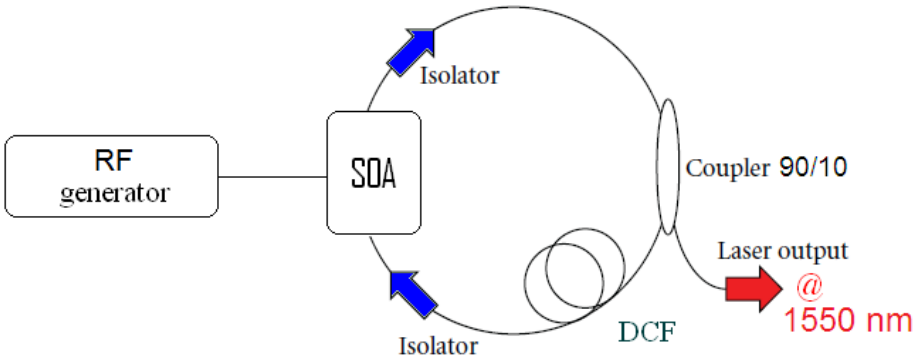

Fig.1. Totally electronically controlled optical swept source

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O 3. Two temperature model for metals: a new "radical" approach: theory versus experiment

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In our work, we present a new approach to build laser-metal thermal interaction model with consideration of solving the two temperatures: electron and phonon temperatures. Using only one Fourier equation, we can get information about 3D thermal fields, surface temperature, and steady state quantum effects temperature while laser shooting on a metal. In this work, we apply the integral transform technique with merging the Anisimov and Nolte models. Our model is check from experimental point of view using iron irradiation with a YAG:Nd laser.

Keywords: Two temperature model, laser-metal interaction.

O 4. Interferometric measurement of light induced refractive index changes

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We introduce a new all-optical method to measure light induced refractive index changes. The method is based on optical interferometry using a pump-probe configuration. This method can be used in single-shot experiments to measure nonlinear refractive index. We compare this method with other methods for nonlinear refraction measurement.

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O 5. Matrix Assisted Pulsed Laser Evaporation synthesis of biomimetic nanocrystalline apatite coatings with applications in medicine

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We report the deposition by Matrix Assisted Pulsed Laser Evaporation technique of biomimetic nanocrystalline apatite coatings on titanium substrates, with potential application in medicine. Metastable, nanometric, poorly crystalline apatites, analogous to mineral bone, were synthesized through a biomimetic approach by double decomposition process. For the deposition of thin films, a KrF* excimer laser source was used (λ = 248 nm, $\tau_{FWHM} \leq 25$ ns).

The results showed that the thin films show improved resemblances to the human hard tissue structures and compositions compared to other calcium phosphates and are therefore expected to insure a better functionality to metallic implant coatings.

O 6. Prospects towards an optical system for trapping and cooling of 138Ba+ ions at CETAL

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Trapped and laser cooled ions are at the heart of recent and spectacular progress in the physics of the last decades, due to unique features which are characteristic for atomic particle confinement within a very small volume of space, under conditions of dynamical equilibrium and minimal perturbation. Within the Photonic Investigations Department at CETAL, we are developing an experimental setup intended for trapping and laser cooling of 138Ba+ ions. We are now testing a complex system intended for pumping and laser cooling the ions at 493 nm, by using a dedicated CW Laser Diode system which is locked to a frequency comb generator, in order to achieve accurate frequency control of the system and thus efficiently cool the ions. This paper presents some preliminary tests performed towards realizing an optical system in order to optically pump the 138Ba+ ions.

O7. Industrial Laser Applications in Romania

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Industrial laser market in Romania is growing. We share the experience we got by installing different high power lasers in Romania: high power diode laser for welding and cladding, CO_2 RF laser from 30 W to 1000 W for engraving and cutting, excimer lasers for microprocessing. The specificity of every applications is described and the trends are envisaged.

O8. Analytic model for laser welding with deep penetration

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In the paper is presented new analytical model of deep penetration laser welding and its experimental verification. The model is an extension of analytical model of 1973. As a result there was derived dependences of penetration length, width of the melting zone and aspect ratio of the zone as a function of welding speed and laser power. The theoretical results was compared with experimental data. The results allows the determination of optimal conditions for keyhole effect. Results of the modeling are expressed in non dimensional parameters therefore can be applied to any metals and alloys for design of laser welding parameters.

O 9. Laser cutting of steel cables used to manufacture pull rods in the automotive industry

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This paper presents the development of industrial laser pulsed cutting technology of twisted steel wired cables used in the automotive industry as a variety types of pull rods. Investigated cables are made from galvanized steel (1770 MPa yield strength) with diameter of 1.6mm, number of strands 6x7+FC. Authors present results of CO2 laser cutting by millisecond pulse with different parameters: power and pulse duration. Paper shows the quality of the cut ends and illustrate results by photographs. Authors noted a significant quality improvement between laser and mechanical cutting. Reduce treatment time of laser cutting approximately tenfold is noted as well.

O 10. Thin-walled titanium's alloy tubes circumferential welding by Nd:YAG compared CO2 laser via theoretical conductive welding model

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Authors of this paper compared circumferential conductive laser welding of thin-walled tubes made of titanium Grade 2 alloy (commercially pure) with 25 mm diameter and 1 mm of wall thickness. Laser welding parameters were selected based on corresponding physical model of conductive welding which includes properties and material constants of mentioned alloy. Comparison of weld penetrations made by Nd:YAG and CO2 lasers allowed to verify physical model and indicated suitable radiation source for titanium alloys treatment. Macrostructure images allowed to determine the quality of welds. Received data are introduction to further discussions about analytical laser welding modeling for industrial applications.

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O 11. Laser photodecomposition of phenothiazine derivative

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The study of photocleavage of Chlorpromazine (CPZ) in order to obtain photoproducts for enhancement of antibacterial properties is reported. CPZ is a pharmacologically active derivative used for antipsychotic properties, having also slight antimicrobial activity against bacteria. The role of $^1O_2$ and the kinetic rates implied in the photoreactions were determined.

The study reports the irradiation of CPZ with 266 nm laser radiation that yields new compounds, some of them being formed via chemical reaction with singlet oxygen. The photoproducts were analyzed by steady state UV-Vis absorption, LIF, FTIR, TLC and LC/MS TOF.

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O 12. STUDY OF THE DYNAMIC EFFECTS AT THE LASER BEAM - PENDANT DROPLET INTERACTION

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Laser induced fluorescence (LIF) and mechanical effects of light on droplets are investigated for two laser dyes (Rhodamine 6G – Rh6G and DCM) and different solvents (ultrapure water; ethylic alcohol and DMSO), volumes (of the order of µl), geometries of irradiation, and concentration of the emitting/pumped dye. When the laser beam is partially or fully absorbed by the droplet's components and is accompanied by laser induced fluorescence (and lasing) effects, the interaction is called resonant and when the laser beam cannot be absorbed by the droplet materials exerting only pressure (mechanical) effects on the droplet itself, is defined as unresonant interaction.

Acknowledgements: The authors from NILPRP acknowledge the financing of the research by MEN-CDI Nucleu project: PN0939/2009 and CNCS – UEFISCDI by project number PN-II-PT-PCCA-2011-3.1-1350.

O 13. SPECTROSCOPIC STUDIES OF UNEXPLORED IMIDAZOLIDINES IN VIEW OF THEIR DNA BINDING AFFINITY CHARACTERIZATION

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Imidazolidine derivatives are important candidates of potential anticancer drugs [1-3]. Extensive research studies are carried out in order to minimize the side effects of these antitumor agents. For this purpose, new synthesized imidazolidine derivatives are proposed to spectroscopic characterization and DNA binding examination [4].

This study presents the spectral properties of 5-(3-chlorobenzylidene)-2-thioxoimidazolidin-4-one ($C_{10}H_7ClN_2OS$, M=238.69 g/mol), generically called SZ-2 as well as of different densities salmon sperm DNA using UV-VIS-NIR and FTIR spectroscopic methods.

Also, the SZ-2 affinity for DNA binding is estimated based on electronic absorption properties of SZ-2 and DNA complex.

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O 14. New boro-phosphate glasses for optoelectronics and photonics

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The presence of boron oxide in the phosphate glass enriches his properties by increasing the mechanical strength, thermal shock and chemical attack resistance as well as water stability.

Design and development of new opto-magnetic vitreous materials was realized. The vitreous matrix comprises network formers meaning phosphorus and boron oxide, together with modifiers and stabilizers like Li_2O and BaO, MgO or ZnO. For the opto-electronic and magnetic properties PbO, Bi_2O_3, CoO or rare earth oxides dopants were added.

Structural and optical characterization by UV-Vis, FTIR, Raman, and AFM of bulk glass was performed. The mechanical properties were measured by indentation techniques.

O 15. Study of Low Clouds Radiative Forcing using MODTRAN 4 Model

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The atmospheric composition is an important factor in climatic changes and climate models take it into account. The earth-atmosphere radiative budget has to be known in the studies on climate change and it is affected by aerosol, clouds and interaction between these components of the atmosphere. To study their impact the numerical models are useful tools. In this study the radiative transfer model MODTRAN4 is used to compute the longwave (LW) and shortwave (SW) radiation fluxes in order to determine radiative forcing of the clouds. The cloud's radiative forcing was computed in two cases: with and without aerosol in atmosphere. The model runs for winter 2008-2009 using hourly values for planetary boundary layer (PBL) height, temperature and clouds' optical properties, as input data. These data were determined from CL-31 Ceilometer, mini-lidar equipment which is located at Atmosphere and Earth Department of Faculty of Physics, at Magurele.

The results showed different intrinsic characteristics of clouds and a dominant influence of downward component of solar radiation on clouds radiative forcing.

Keywords: clouds, radiative forcing, radiative budget

POSTER PRESENTATIONS

P 1. Pump energy reduction for a high gain Ag X-ray laser using one long and two short pump pulses

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A novel pump scheme with one long and two short pump pulses is proposed, in a grazing incidence pumping X-ray laser configuration. A 360 ps long pulse, prepares a plasma in a low charge state. Then, a first short pulse ionizes the plasma to an optimal charge state, while the second short pulse induces strong collisional excitation in the gain region. With only 200 mJ of pump energy on target, a compact Ag x-ray laser at 13.9 nm with a gain coefficient of 55 cm−1 was achieved[1].

The research leading to these results has received funding from LASERLAB- EUROPE (grant agreement no. 228334, EC's Seventh Framework Programme), from COST MP0601 action: Short Wavelength Lab Sources, and from UEFISCDI- PN2-PARTENERIATE-1/2012 project.

[1]"Pump energy reduction for a high gain Ag X-ray laser using one long and two short pump pulses", By: Banici, Romeo A.; Cojocaru, Gabriel V.; Ungureanu, Razvan G.; et al. OPTICS LETTERS Volume: 37 Issue: 24 Pages: 5130-5132

P 2. Thin film beam splitter multiple short pulses generation for enhanced Ni-like Ag X-ray laser emission

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An alternative, novel multiple pulses generation scheme is implemented directly after the optical compressor output of the XRL pump laser. The new method uses a polarization sensitive thin film beam splitter and a half wavelength waveplate for tuning the energy ratio in the multiple short pulses. Based on this method, an extensive study of the running parameters for a grazing incidence pumped Ag x-ray laser pumped with a long pulse of 145 mJ in 6 ns at 532 nm and up to 1.45 J in few picoseconds at 810 nm. Five fold enhancement in the emission of the silver x-ray laser is demonstrated using the new pump method[1].

The research leading to these results has received funding from LASERLAB-EUROPE (grant agreement no. 284464, EC's Seventh Framework Programme) for experiments at LASERIX facility, from the UEFISCDI project PN2-Parteneriate-1/2012 and is supported by Extreme Light Infrastructure Nuclear Physics (ELI-NP) Phase I, a project co-financed by the Romanian Gou- vernment and European Union through the European Regional Development Fund.

[1]"Thin film beam splitter multiple short pulse generation for enhanced Ni-like Ag x-ray laser emission", By: Gabriel V. Cojocaru, Razvan G. Ungureanu, Romeo A. Banici, Daniel Ursescu, Olivier Delmas, Moana Pittman, Olivier Guilbaud, Sophie Kazamias, Kevin Cassou, Julien Demailly, Olivier Neveu, Elsa Baynard, and David Ros OPTICS LETTERS Vol. 39, Issue 8, pp. 2246-2249 (2014)

P 3. Characteristics of photoionization and high harmonics generated in the low density plasmas using ultrashort and intense *fs* laser pulses.

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In this work we present results from the simulation of the high order harmonics generation (HHG) occurring at the interaction of ultrashort and intense laser beams with low density Al plasma created on a solid surface. High harmonics are generated with the aid of a femtosecond Ti-Sapphire laser beam with pulse duration ranging from 60 to 100*fs*, I = 800*nm* and focused intensity of 18 2 10 *W / cm.*

The numerical simulation is performed with a 1D3V particle-in-cell code. Experimentally, this particular mechanism has been modestly explored due to the multiphoton effects that can occur near the ionization threshold, effects leading to a difficult identification of the harmonics. In order to get more insight on these effects, we have calculated the photoionization cross-sections of Mg-like Al ions within the R-matrix theory and code.

P 4. Measuring very low optical powers using a commercial CMOS camera

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We introduce a procedure to calibrate a commercial low cost CMOS camera, for optical power measurements. This allows one to use the camera as a very sensitive optical power meter that is able to measure powers down to fW level. The procedure is based on converting the average pixel gray level to optical power. We have calibrated the CMOS camera using a conventional power meter. We use a windowing technique to ensure a good signal-to-noise ratio over a large range of the measured optical powers. Using this procedure we have measured optical powers of 25 fW.

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P 5. Nano-patterning of the materials surface by laser enhanced photoresist mask

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In this work a new laser near-field processing method based on photoresist mask is presented. This is an alternative method to the classical laser near-field lithography with colloidal particles. The limitation of the hexagonal symmetry, imposed by the auto-arrangement of the colloidal particles can be overcome if photoresist structures, fabricated by two photon photopolymerization, are used as focusing elements. Controlling the shape and the arrangement of these elements any designed pattern can be produces on materials surface by laser near-field ablation. The theoretic field distribution under the photoresist mask was computed with Finite-Difference Time Domain (FDTD) method.

P 6. Optical properties of Nickel oxide thin films obtained by pulsed laser deposition

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Nickel oxide thin films were obtained by Pulsed Laser Deposition (PLD) and radio-frequency assisted PLD (RF-PLD) techniques on Si substrates. Nickel oxide thin films are obtained by irradiating a Ni metallic target in oxygen atmosphere. The influence of substrate temperature on the properties of the thin layer was carried out.

Topography of surface of Nickel oxide thin films was studied using atomic force microscopy (AFM). Optical properties of nichel oxide (NiO) thin films are investigated using spectroscopic ellipsometry.

The dielectric function of Nickel oxide was calculated using a single Lorentz oscillator model. The dispersion of the refractive index in the 250 –1700 nm range was calculated. Thicknesses of the films and of their rough layer are extracted from Cauchy model. Other optical properties as optical band-gap and extinction coefficient were also extracted.

P 7. Laser printed thin films of ferrocene compounds for non-linear optical applications

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Ferrocene-derivatives have been intensely studied for applications in optoelectronics and sensor development, in bulk or as thin films. In this work, we report on the growth of such thin films by matrix-assisted pulsed laser evaporation (MAPLE), at low fluences (0.2–0.7 J/cm^2), using a Nd:YAG pulsed laser device (4ω / 266 nm, τ = 7 ns, ν = 10 Hz). Spectroscopic-ellipsometry (SE), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and atomic force microscopy (AFM) techniques, were used to investigate the structure, morphology and optical properties of the films. Second harmonic generation (SHG) capabilities were evidenced when irradiating the films by a Ti:sapphire pulsed laser (1ω / 800 nm, τ = 60 fs, ν = 80 MHz, P = 700 mW). Finally, MAPLE grown films were used as donors for printing micrometric pixels, by laser-induced forward transfer (LIFT) (Nd:YAG, 3ω / 355 nm, τ = 50 ps, ν = 10 Hz). Laser printing allows accurate control in pixels size, shape and position, needed in optoelectronic applications. The pixel's morphology, structure, and optical behavior are presented and discussed with respect to the ambient pressure during LIFT, fluence, and donor film thickness.

P 8. The third-order nonlinear optical response of Rhodamine 610-doped DNA-CTMA complex

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The third-order optical nonlinearities of deoxyribonucleic acid (DNA) -cetyltrimethylammonium chloride (CTMA)-Rhodamine 610 dye (10% wt) complex in butanol are experimentally investigated. In order to see the contribution of DNA-CTMA in the overall nonlinear optical response of our samples, these results were compared with those obtained, in the same experimental conditions, on Rhodamine 610 (10% wt) in butanol. In experiments we used the double Z-scan and double I-scan techniques, at three different wavelengths, in continuous wave and femtosecond pulsed regimes. The nonlinear optical response of these biomaterials is important for their applications in photonics and optoelectronics.

Acknowledgements: The authors acknowledge the UEFISCDI Partnerships Project No. 3 /2012 “Bio-Nano-Photo”.

P 9. Diffraction on dynamic gratings induced by laser in 5CB liquid crystals doped with DY7 dye

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The diffraction on dynamic gratings induced in dye doped liquid crystals (LCs) by the interference of two laser beams was investigated. LCs have an important role in nonlinear photonics due to their extremely large nonlinear refractive indices and various mechanisms involved in the nonlinear response. By monitoring the diffraction efficiency of a probe beam (633 nm) on the gratings induced in 5CB – DY7 compound by the interference of two laser beams at 514.5 nm, the magnitude of the nonlinear response has been determined and the temporal evolution of the gratings has been analyzed. The mechanisms involved in the overall nonlinear response are under current investigation. These results are important for applications of dye doped LCs in nonlinear photonic functionalities.

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P 10. Developement of a fiber laser for medical applications especially for urology
~ ELASMEDURO- THULAS ~

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THULAS 1 1was developed through a European structural funds project: Elasmeduro. THULAS 1 is a laser with active medium fiber optic doped with Thulium in a resonator with Bragg gratings. Fiber optic active medium is pumped by diodes with narrow wavelength and coupled with a visible laser marker to mark active laser area. This type of laser configuration allows obtaining a good conversion efficiency and has a high reliability. This is a compact laser without needing maintenance during its time life.

. **P 11. Resonant effects on medicine solutions irradiated at two different UV laser beams: droplets and bulk experiments**

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The multiple drug resistance developed by bacteria requires flexible approach to find medicines able to overcome it. One solution could be the exposure of existing medicines solutions to UV laser beams in order to obtain photoproducts that are efficient against bacteria. This can be done in droplets or bulk. In this paper the interactions of 266nm and 355nm laser beams with microdroplets and bulks containing solution of 10mg/mL Chlorpromazine (CPZ) in ultrapure water are investigated. It was observed that the resonant effects are irradiation wavelength–dependent, and are four times shorter at 355nm than the exposure at 266nm.

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P 12. Spectroscopic evidence of antibiotic solutions modificatons at interaction with laser radiation

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The modification of antibiotic molecules, e.g. Vancomycin (VCM), at interaction with laser radiation was evidenced by UV-Vis absorption and FTIR spectra of the VCM solutions recorded before and after exposure to laser radiation. At the same time the laser induced fluorescence (LIF) spectra yielded real-time information about the modifications of VCM molecules while exposing the medicines solutions to laser beams. The modifications induced by the laser radiation depend on the experimental conditions, like energy of laser beam, exposure time, volume and concentration of the irradiated samples.

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P 13. Foam stability study in view of endovenous sclerosant therapy

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Foams, as all dispersed system, are thermodynamically unstable. One of the most important factors that influence foam stability is the addition of surfactants and/or nanoparticles. The stability is the result of two competing forces: capillary drainage of liquid towards Plateau borders and disjoining pressure (Π). The addition of surface active substances will produce modifications in surface tension, but the foam stability is determined mostly by the surface rheological properties of adsorption layers at the liquid interfaces. The drainage effect can be slowed down by an increase of the surface viscosity and liquid viscosity but increased viscosity will influence the bubble size distribution within the foam; an increase in bubbles size is undesirable since it can produce adverse effects when the foam is injected in the bloodstream.

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P 14. Phenothiazines solutions exposed to laser radiation in interaction with special surfaces, in view of biomedical applications

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Wetting characteristics play a significant role in medical treatments, for this reason the wettability of surfaces by medicines solutions, using phenothiazine derivative aqueous solutions was investigated. Chlorpromazine, Promazine and Promethazine were exposed to 266nm Nd:YAG pulsed laser radiation. The irradiated samples have been studied using pH measurements, UV/Vis/NIR absorption spectrophotometry, laser induced luminescence, Thin Layer Chromatography and surface tension measurements. Contact angle measurements were completed on Standard Cotton, Polyester and Parafilm. Phenothiazines solutions exposed to prolonged irradiation may have much better activity against several bacteria. Therefore, an important objective consisted in development of a new method to fight the multiple drug resistance acquired by bacteria.

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P 15. Potential of elemental analysis by LIBS in dental research

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Dentistry emerged as a leading field for biomedical laser applications. The developments of LIBS offers now a reliable surface analysis method for dental hard tissues and biomaterials. LIBS is convenient for sensitivity, operation ease and rapidity, and because it works in atmosphere. We analyzed by LIBS three dental composites and the cementum on a tooth root. The composites evidenced B, C, N, O, F, Al, Si, Ca, Sr, Zr, Ba, Yb, Hf, most of which were detected previously by ERDA, RBS, PIXE and XRF. LIBS-detectable compositions of dental composites show a large variety. In cementum we detected Ca and possibly F, Mg, P, K. Multielement line overlapping is a major difficulty in the analysis of LIBS spectra and reference materials are needed.

P 16. Developement of a diode pumped laser for medical applications especially for urology
~ ELASMEDURO- SOLAS~

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SOLAS 1 was developed through a European structural funds project: Elasmeduro. Solas1 is a solid state diode pumped laser, executed using a plan-plan compact laser resonator and a high precision cooling system for pumping diodes and laser rod. The laser has an intelligent command control system with touch screen special protected for industrial and medical application field that allow to the user laser control and display laser state information. Lasers use an user friendly graphic interface displaying the information in a simple and accessible way for operator.

P 17. MAPLE deposition of organic structures on IZO flexible substrates

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We report the deposition of organic structures based on maleic anhydride–aniline derivatives (maleic anhydride-cyano aniline-A3 or maleic anhydride-2,4 dinitroaniline-A6) and tetracyanoquinodimethane (TCNQ) by matrix assisted pulsed laser evaporation (MAPLE) method on In doped ZnO (IZO) electrode. IZO films were obtained by pulsed laser deposition (PLD) on biaxially-oriented polyethylene terephthalate (Mylar). After the deposition, the IZO films were annealed up to 150^{O}C for 1h or oxygen plasma treated at 0.6 mbar for 60 s. The MAPLE films were characterized by UV-VIS, Photoluminescence and FTIR spectroscopy. Atomic Force Microscopy was used to investigate the morphological features of the obtained layers. I-V characteristics of (metal/maleic anhydride–aniline derivative /TCNQ/IZO/flexible substrate) structures were recorded in dark and under the illumination with solar simulator (AM1.5). We found a good transparency of the organic film/IZO structures and the preservation of the PL properties after the laser transfer of the monomers. An improvement of electrical and optical performances was observed after the post-deposition treatments of IZO films. The correlation between the morphology and the electrical properties of the thin films was also investigated. I-V measurements revealed a diode behavior for metal/TCNQ/A6/IZO(annealed)/Mylar structure.

P 18. Matrix Assisted Pulsed Laser Evaporation vs. Dip Coating techniques for fabrication of biodegradable polymer thin films with medical applications

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Thin films of polycaprolactone-polyethylene glycol were deposited on titanium and <100> double side polished silicon substrates by matrix assisted pulsed laser evaporation (MAPLE) and dip coating (DC) techniques using chloroform as a matrix solvent.

For obtaining suitable film morphology we identified an optimum laser deposition regime, 500 mJ/cm^2, in the case of MAPLE deposition method. As for the dip coating method we considered for the further studies the most adequate conditions parameters to be: 100 mm/min withdrawal velocity. The studied methods present strong advantages, the choice between them depending on the desired properties of the biodegradable coatings.

P 19. Optical properties of titanium dioxide thin films deposited by laser methods

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Due to its excellent optical, chemical and biocompatibility properties, titanium dioxide is widely used in thin films/nanoparticles-deposited form for many applications. Here we report on the deposition of TiO_2 thin films by (Pulsed Laser Deposition) PLD and (Matrix-Assisted Pulsed Laser Evaporation) MAPLE. A comparison between the properties of layers obtained by these methods was carried out. Optical properties of the deposited thin films were investigated by Spectroscopic Ellipsometry (SE) and surface morphology by Atomic Force Microscopy (AFM). The optical constants of TiO_2 were calculated using a Cauchy-Urbach model; the refractive index dispersion in the 400 –1000 nm range was evidenced.

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P 20. Biodegradable silk fibroin/poly(sebacic acid) diacetoxy terminated composite coatings obtained by matrix assisted pulsed laser evaporation

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Composite silk fibroin – poly(sebacic acid) diacetoxy terminated (SF-PSADT) biodegradable coatings with different weight ratios (1:4, 1:1, 4:1) were deposited by Matrix Assisted Pulsed Laser Evaporation (MAPLE), studying their physico-chemical properties, as first step of applicability for biomedical applications.

FTIR spectra demonstrated the stoichiometric transfer of the thin films, which preserved the chemical composition of constituents, while the XRD diffractograms revealed their partial crystallinity. Together with wettability measurements, showing superhydrophilic behaviour, and degradability tests, these results provide supportive information for release applications, where degradation rate may be tuned by controlling different composite material characteristics, mainly mixture ratio and crystalline status.

P 21* . The effect of the C content on the properties of ZrC thin films synthesized by pulsed laser deposition

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ZrC films were grown by the Pulsed Laser Deposition technique. By changing the deposition conditions, films having a wide range of grain sizes, densities and stoichiometries were obtained. We investigated the optical properties of ZrC films by measuring the optical reflectance from 30 cm^{-1} to 30 000 cm^{-1}. The results indicated that ZrC films exhibited high reflectivity in the mid IR range, very low resistivity values together with low wear rates and high thermal stability. These excellent qualities recommend the ZrC films for applications as thermal radiators working at very high temperatures in the outer space.

P 22* . Spectroscopic investigations of amorphous indium zinc oxide thin films with compositional gradient

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Recently, indium zinc oxide was shown to exhibit high transparency in the visible range, low resistivity, and high mobility. Since the properties and costs depend on In/(In+Zn) values, the measurement of this ratio is paramount for future developments. We report on accurate analysis of elemental composition of IZO thin films obtained by Combinatorial PLD. The monitoring of the elemental composition was performed by LIBS. The results were compared to values obtained by EDX and RBS. A good agreement between methods was found, the relative fraction of indium and zinc varying from 65 to 90 and 35 to 10 at%, respectively.

P 23. Tin oxide thin films deposited by MAPLE from nanoparticles obtained by laser pyrolysis.

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First gas sensors based on SnO_2 were developed by Naoyoshi Tagouchi in 1968; the importance of this material for gas sensing applications grew according to the needs of improved gas detecting sensibility and variety. This paper reports on the deposition of thin films by MAPLE (Matrix Assisted Pulsed Laser Evaporation) from tin oxides nanoparticles obtained by Laser Pyrolysis. Tin oxides nanoparticles obtained by Laser Pyrolysis are characterized by small particle sizes and structural homogeneity. Tetrametyl tin, ethylene combined with an oxidized atmosphere was used as reactive gas mixture. Two types of nanopowders samples have been selected: the first contain mainly tin(II) oxide whereas the second contain mainly tin(IV) oxide. The as prepared samples were also thermally treated at 300^0C for 3 hours in order to decrease the proportion of the SnO phase. Therefore one of the thermally treated powder exhibits an almost pure SnO_2 phase XRD pattern. Water based dispersions with 2.5 g/l powder concentration have been prepared as MAPLE targets from both as synthesized and thermal treated samples using an ultrasonic procedure. The grown films were analyzed by X-Ray diffraction, Atomic Force Microscopy and Scanning Electron Microscopy.

P 24. Correlation studies between the optical and the morpho-structural properties of thin bismuth oxide films grown by pulsed laser ablation

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Bismuth oxide thin films were deposited on Si (100) substrates by using pulsed laser ablation of pure bismuth targets in controlled oxygen atmosphere. Crystalline films were obtained, with good adherence to the substrate and with uniformity depending on the deposition conditions (number of laser pulses and the use of a radio-frequency discharge of the oxygen inside the deposition chamber). The optical data were processed within several models for the refractive index, in order to infer representative intrinsic optical parameters. The results of the optical and morpho-structural analysis are well correlated.

Keywords: bismuth oxide films, laser ablation, atomic force microscopy, refractive index.

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P 25. Influence of deposition parameters during rf magnetron sputtering process on TCO thin films

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In the present paper we investigated transparent contact oxides (TCO) such as AZO, ITO and SnO_2 thin films, deposited by rf magnetron sputtering as transparent contact electrodes in high quality chalchogenide solar cells. Therefore, a reliable assessment of their crystallographic and optical properties is essential. The influence of growth parameters (i.e. oxygen pressure, flow rates, or the forward power) on the morpho-structural characteristics of the thin films were also investigated.
These TCO thin films with different thicknesses (30 - 50 nm) were deposited onto glass substrate using a constant deposition rate for each material. The AFM and SEM investigated images showed profiles that are densely packed and well adherent to the surface of the substrate. The XRD images revealed that all films have a strong orientation after the main planes perpendicular to the substrate. It was highlighted that ITO and SnO_2 have good conductivity, with resistance values in the order of ohm and tens ohms, whereas AZO depends on the Al (2%) doping to exhibit improved properties.

P 26. Laser techniques for the deposition of Mg-Al and Zn-Al layered double hydroxides

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Pulsed laser deposition (PLD) is commonly used for the deposition of various thin films, most of them being inorganic materials while matrix assisted pulsed laser evaporation (MAPLE) mainly for soft materials (organic/ inorganic) no matter their stoichiometry. We present a comparative study of the ability of these two laser techniques for obtaining well oriented layered double hydroxides films with controlled thickness, adherence and stoichiometry preservation during the laser transfer from the parent target/powder to the film. Layered double hydroxides (LDHs) are a class of layered materials consisting of positively charged brucite-like layers and exchangeable interlayer anions, which have received increasing attention in the last years, due to their chemical versatility and to their prospects in a wide range of technological applications such as catalysis, separation, and environmental remediation. The proper conditions (wavelength, fluence, repetition rate, duration of the pulse, preparation of frozen targets) for obtaining highly oriented Mg-Al and Zn-Al LDHs films were determined. The LDHs films were characterized using X-Ray Diffraction, Atomic Force Microscopy and Scanning Electron Microscopy with energy dispersive X-ray analysis.

P 27. Analytical and experimental estimation of a keyhole shape during laser welding with bifocal welding head

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Manuscript applies base information of a keyholes forming during laser welding with bifocal welding head. Analytical estimation of keyhole shape based of moving heat source, assuming changing of thermo-physical material properties was made. An experimental description of CO_2 laser welding process with various setting of bifocal position was presented. Comparison of welding keyhole shape for constant process parameters with changing configuration of the bifocal welding head was shown.

P 28. Comparison cutting stainless steel for the laser and water-jet machining

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This article presents the quality aspects of both laser and water-jet cutting methods. Cases on cutting stainless steel EN 1.4016 / AISI 430 of different thicknesses are discussed in a comparison study. Using high-resolution digital photography, the cutting diameter at the entrance to the material have been measured. The study included examination of thermal deformation and burr formation. Water-jet technique is devoid of thermal effects and burr formation are very small. Laser technology thermally deformed material, which is growing with the increase in thickness of the material. The cut surface roughness and taper cutting surface are higher in the hydro-abrasive technology than the laser cutting. Speed of cutting machines with defined powers are compared with one another.

P 29. Theoretical modelling of laser welding of Ni – Pt spark plug for bio-fuel engine

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The interaction of laser beam with dissimilar metals during welding process was studied theoretically. A finite element based three-dimensional transient heat transfer and fluid flow model was applied for prediction temperature distribution and material mixing field as well as weld dimensions. The model was used for study and optimization process parameters of welding of Ni – Pt spark plug for bio-fuel engine. The laser pulse width duration and energy, and the angle of incidence of the laser beam to

the surface were analyzed. The shape of the melting pool obtained from the theoretical model was close to experimental results.

P 30. The use of laser micro-welding to increase the durability of spark plugs with iridium-tipped electrodes operating in biogas-fuelled engines

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In this paper, fillet micro-welding by laser of iridium tips to the middle electrode of the spark plug was analysed. The tips, 2 mm in length and 0.8 mm in diameter, were initially positioned and bonded to the butt surface of the central electrode using the resistance welding technique. The tips, attached as above, were Nd:YAG laser welded by means of partially overlapping individual pulses. Pulse duration and the laser beam power were the variable parameters. Metallographic sections of the welds were made, which were then subjected to microscopic observations. The microscopic analysis revealed the occurrence of micro-cracks inside the welds and on their boundaries.

P 31. Effective use of illumination in vehicles through the laser engrave lamps

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While driving in the dark, we use artificial sources of light, i.e., the vehicle's headlamps, to illuminate the road ahead. If we are the only road users, we can increase visibility by turning on our high beams. If, however, there are vehicles approaching from the opposite direction, the visibility conditions worsen. Firstly, because we switch our headlights to low beams; and secondly, because the lights of the oncoming vehicle cause our eyes to adapt to new conditions. The lights of the vehicles coming from the opposite direction glare, which makes our eyes respond. As our pupils constrict, we find the road ahead suddenly darker. Thus, if an obstacle appears on the road ahead, we are less likely to notice it early enough to avoid it. A good solution would be to use artificial illumination of the road. Under such conditions, the driver's eye adaptation process is faster. It is possible to better observe the road around and avoid dazzling effects.

The aim of the study was to measure the luminous flux and analyze the distribution of the luminous intensity of a conventional reflector, as used in the A6 Audi headlight assembly, before and after modification. The modification involved laser-cutting the surface of the cover lens in order to change the luminous intensity distribution. As a moving vehicle is able to direct more light to the roadside, pedestrian safety will improve. The study of the low- and high-beams of the Valeo reflector was conducted under laboratory conditions and included a comparative analysis of the luminous intensity of the reflector before and after modification.

P 32. The selected properties of fusion of Fe foam and sheet metal with use of the Nd: YAG laser

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In the paper there werepresented possibilities of combining metal sheet with metallic foams using a Nd: YAG laser. The research were carried out over the properties of laser welded joint of micro-welds iron foam with superalloy HYNESH230®.

The joints were investigated with metallographic methods and EDS analyses. The studies used to determine the basic quality parameters of the welded joint. Using EDS analysis, there were identifiedthe type of alloying elements and the extent of diffusion from superalloy H 230®in the course of Fe foam. Also, there was investigated shear strength of obtained micro-welds.

P 33. Numerical simulation of weld pool shape during CO_2 laser melting of AISI 304 stainless steel

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Three-dimensional transient finite volume model for conduction mode welding was developed to study the weld pool shape during CO_2 laser melting. AISI 304 stainless steel was used in the research. Due to the multimode laser power density distribution Gaussian distribution was considered. Convection and radiation heat exchange with the surrounding medium as well as heat loses due to the vaporization were include. To obtain more accurate results temperature dependent material parameters were used. Results obtained from computations are close to the measurements acquired from cross sections.

P 34. Sulfur–containing Fe@C nanocomposites using one-step laser pyrolysis technique

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Gas-phase laser pyrolysis technique was employed to synthesize Fe-based magnetic nanocomposites in a single step process. Using different ratios between $Fe(CO)_5$ and CS_2 vapors (1:2, 1:1 and 1:0.5) and C_2H_4 as senzitiser, we obtained three samples containing mixtures of iron-containing phases: metallic, carbides, oxides (maghemite) and sulfide (pyrrhotite), as revealed by XRD diffractograms. The oxide presence is due to the post-synthesis air exposure of the samples. Their oxidation degree seems to increase with the diminishing of the sulfur precursor flow. TEM images reveal aggregates of nanoparticles with core-shell morphology for the sample with the highest sulfur content. In the sample resulted from using equal flows of $Fe(CO)_5$ and CS_2, fibrous aggregates of nanostructures with main empty core and porous shell morphology was observed. Magnetic hysteresis curves for the second and third sample reveal a weak ferromagnetic behaviour with 18 or 23 emu/g saturation magnetization values. Due to their content in zerovalent iron and nanometric size, these nanostructures have the potential to be applied for water remediation or as catalyst for Fischer-Tropsch synthesis or coal liquefaction.

P 35. The influence of diamino propane in functional groups generation of iron oxide nanoparticles synthesized by laser pyrolysis

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Nanoparticles based on iron oxide are intensively studied due to biocompatibility combined with magnetic properties. Iron oxide nanoparticles used as carriers require their surface functionalization. Laser pyrolysis generates under optimal conditions iron oxide nanoparticles with superparamagnetic properties and high saturation magnetization.

The diamino propane addition in basic reaction mixture (oxygen, iron pentacarbonyl vapors) has been studied comparing the differences in elemental composition, crystalline surfaces and mean particle size distributions.

The nanoparticles obtained from precursors containing or not the diamino propane group in reactive mixture were analyzed by: XRD, SEM, EDAX, TEM and FTIR. The specific synthesis conditions for generating functional groups obtained by in situ decomposition of diamino propane in reaction mixture have been identified.

Two samples synthesized in similar conditions, one based on the reactive mixture and the other containing diamino propane have been selected.

Their elemental composition has been analyzed by scanning electron microscopy using EDAX facilities and their morphological structural properties by XRD, TEM and FTIR, respectively.

P 36. N doped iron-carbon core/ shell nanocomposites synthesized by Laser Pyrolysis

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Zero-valent iron based nanostructures have been widely used in different decontamination processes due to their catalytic action combined with a high specific surface. The synthesis, stabilization and functionalization of zero-valent magnetic nanoparticles based on their capture efficacy in magnetic separation on different classes of chemical agents are also important issues. Nitrogen addition in the reactive flow mixture and an inlet configuration with three concentric tubes were used in the laser pyrolysis reactor to synthesize iron- carbon based nanoparticles with different N doped values. Ammonia, ethylene, hydrogen and $Fe(CO)_5$ vapors were used as reactive precursors. The carbon donor source (ethylene) was prediluted at different proportions with Ar. Also the pressure and incident laser power were tailored to synthesize iron based cores with carbon based shells whose protective efficiency was proved by studding the oxygen percentages in elemental composition of as synthesized nanopowders. The methods for nanomaterials characterization and N doping control are X-ray diffraction (XRD), elemental analysis by electron dispersive spectroscopy (EDS) and electron microscopy (TEM, SEM). Also magnetic measurements were also performed in order to stabilize the influence of N doping level on magnetic parameters. From the hysteresis loops the saturation magnetization values of sample synthesized in the presence of hydrogen are higher (about 90 emu/g) as compared to the samples synthesized in the presence of ammonia (about 75 emu/g) For the second sample a presence of 10.3 at.% N has been measure by EDS analyze.

P 37. Penning discharge as an electron beam source

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The characteristic parameters of a glow discharge used for the extraction of electron beams of 10 to 15 keV are discussed. Plasma is obtained in a hollow anode Penning source with two cathodes. The Paschen characteristic of this discharge is presented. The magnetic field, the gas pressure inside the plasma source and the applied voltage are important parameters that determine the discharge current and the electron extraction current and have been studied experimentally.

P 38. Coaxial plasma gun used in dusty plasma experiments

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A miniature coaxial gun inserted between the plane parallel electrodes of a radio-frequency (rf) plasma was used to produce a plasma jet consisting of electrons and argon ions [1]. The coaxial gun had two electrodes made of stainless stell, a long center rod and a coaxial outer cylindrical shell. A compressor coil was mounted at the gun nozzle to radially compress the plasma jet. The axial JxB force ejected plasma out of the gun at a speed of a few km /s. We were interested in producing a well collimated jet stream which was directed towards a dusty plasma crystal made of aligned cilindrical particles. The dust particles were rods with a length of 300 microns and diameter of 5 microns. The discharge voltage of the gun was between 0.1kV and 8 kV and the discharge current was a few hundred mA. Images of the dust particles interacting with the plasma flow were captured with a PhastCam 1024 PCI having the capability to acquire at thousands of frames/s, a lens provided with a set of 3 spacers (68 mm in length) and a teleconverter 3x. The camera speed was set at 250 fps with an exposure of 4 ms. Interesting phenomena could be studied in this type of experiment such as dust particle acceleration or particle oscillations.

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P 39. Rotating dust rods in plasma between two equilibrium states

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The motion of asymmetric particles, cylindrical or microrods, in complex plasma can greatly expand the frontiers of complex plasma research. In this paper, we investigate dust dynamics in complex plasma with cylindrical particles. The experiments were performed in an RF parallel-plate reactor. Nylon cylindrical rods with 5 μm in diameter and a length of 300 μm were used to create a levitating cloud in the sheath of a RF argon plasma. Up to now in subsequent experiments two states of equilibrium have been established: the vertical [1, 2] and the horizontal one [3].

We have measured the angular velocity of the particles when they pass from one equilibrium state to another. From the dynamics of the grains we note that the angular velocity increases in time with the increase of gas flow.

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P 40. Plasma extracted electron beam characteristics

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The analysis of 10 to 15 keV electron beams extracted from a glow discharge is presented. Electrons were produced by a hollow anode Penning source and focused by two biased coils. The discharge voltage is 750 volts while the working gas pressure in the discharge area is 10^{-3} milibars. The extraction voltage was 10 to 15 kilovolts. The influence of the focusing coils on the electron beam is discussed. The beam current was measured with a Faraday cup and is in the range of 10^2 miliampers. The profile of the beam was determined using a wire scanner and polymeric screens.

P 41. Corrosion monitoring by optical inspection in coherent and incoherent light

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We present an experimental study on corrosion monitoring by using optical methods, in both coherent and incoherent light. The corrosion is a surface degradation process and the optical methods, especially that based on coherent light, are sensitive techniques to detect surface alterations. A steel sample to be studied is introduced into a corrosion cell connected to a PGstat device. While the sample undergoes a corrosion process at a rate controlled by the PGstat device, its surface is illuminated incoherently and inspected periodically by a digital microscope. Alternatively, the sample is illuminated by coherent light and a video camera without lens record a speckle pattern in an objective speckle setup. We compare the two techniques and point out what new information is revealed in the case of coherent illumination.

P 42. Dispersive elements for THz domain

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In our work we present the realization and characterization of some dispersive elements for a THz spectroscopic imaging system. These optical components must be realized from a material transparent or reflective for the (0.1÷3) THz domain (100-3000 µm wavelength range, respectively). Two gratings (working in transmission) and a prism were made using “industrial” technology: tools from a machine shop and a laser cutting machine**.**

P 43. Surface-enhanced Raman scattering assessment of structural changes and dynamics in plant genomic DNAs

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Vibrational modes of molecules that are located within several nanometers at the surface of a metallic nanoparticle are observed by SERS. In this work, surface-enhanced Raman spectra of genomic DNAs from leaf tissues of different plant species, were recorded and discussed, respectively, in the 200-1800 cm^{-1} spectral range. SERS signatures, spectroscopic band assignments and structural interpretations of these plant genomic DNAs are reported. Besides, we have shown that

surface-enhanced Raman scattering can be used to study the fast subpicosecond dynamics of DNA in the proximity of a metallic surface.

P 44. Optics education in the frame of "i-BEST" project

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The scope of the project "Inquiry-Based Education in Science and Technology – i-BEST" (http://education.inflpr.ro/ro/IBEST.htm) is to bring innovation in the way sciences are taught in schools. In the frame of the project, learning units were adapted and training kits were developed. The learning units on optics were adapted from the French program "La main à la p_te", the European projects "Pollen" and "Fibonacci" and from the "Hands-on Optics" program of the NOAO in USA. Teachers can find the learning units in the Virtual Library, on the TeachScience platform (http://81.181.130.13/teachscience/). These materials contain guidline materials for teachers and working sheets for school students.

P 45. Testing setups for mid-IR active and passive optical components

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The present paper refers to the setups we proposed to be used for the characterization of mid-IR passive and active optical components, in the frame of the project "Evaluation of components for space applications". The project is the ***first attempt*** to assess the operating performances of mid-IR semiconductor lasers, along with detectors and optical components as these devices will be subjected to various irradiation conditions. The investigations will cover electrical, optical and optoelectronic characteristics evaluation. The expected results of the project will fill the gap related to reliability of mid-IR components under irradiation, for possible use in space missions.

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