

**Universidade do Minho**

Escola de Ciências

Centro de Física

**Centro de Física da Universidade do Minho**

**Relatório de Atividades**

**2012**

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# Part 1 General Information

## 1.1 Introduction

The Physics Centre of the University of Minho (CFUM) is a research unit with a multi-disciplinary scientific activity in the field of Pure and Physics and adjacent areas. In December of 2012, it included some 61 effective members with PhD and 1 without PhD (51 UM teaching staff and 11 full-time researchers contracted in the framework of the Ciência 2007 and 2008, and Welcome II Programs), 4 PhD staff members of other Portuguese universities, 11 post-doctorate researchers, 40 PhD students enrolled at the UM School of sciences and 31 students with short-term grants (mostly in the framework of FCT-funded projects).

The scientific activity of the CFUM concerns 4 major areas of research: (i) Condensed Matter Physics, (ii) Nanomaterials: Technology, Physics and Application, (iii) Molecular Physics and Biophysics; and (iv) Optics, Optometry and Vision Science, organized in seven research groups. There are currently 33 research laboratories located in Braga and in Guimarães, the space being provided by the School of Sciences of the University of Minho. Each laboratory has a responsible person among members and is attributed to one of the research groups. Technical support is provided by the personnel of the Department of Physics (one electronics engineer, one electronics technician, one specialized engineer supporting the Thin Film Laboratories and three general technicians in Braga plus two general technicians in Guimarães). Administration support is provided by three experienced collaborators (University personnel), one full time and two part-time. In addition, the CFUM itself contracts an additional collaborator who provides administration support to several projects in course and to activities aimed at attracting external funds.

The managing bodies of the CFUM include: (i) Director, elected among the Full or Associate Professor of the physics Department, every three direct election, (ii) Deputy Director (appointed by the Director), (iii) Executive Committee, composed by the Director and the coordinators of the seven research groups, (iv) Scientific Council, composed by all members holding a PhD, and (v) Steering Committee, an advisory board constituted by 5 internationally recognized scientists that help to evaluate, supervise and improve Centre's activities. New members of the Steering were nominated in 2011. Last visit of the Steering Committee to the Physics Center took place in February 2012, the report is attached in Appendix.

## 1.2 Achievements

There are several research topics at the CFUM where a significant progress has been achieved and important research results have been published. These are highlighted by the Research Groups in the corresponding sections of this report.

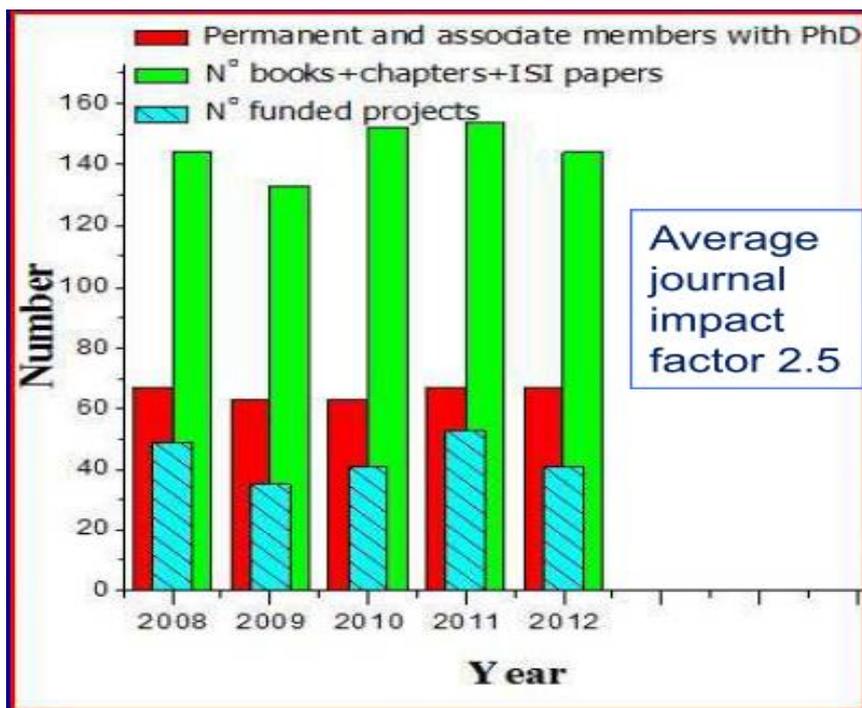
Here, some achievements of the Centre as a whole are emphasized, which contribute to its visibility and sustainable development:

- The number of article citations has reached the number 20000, since 1994, increasing the Hirsh index to 50,  $h=50$ .
- The Center of Physics has researchers in the editorial boards in 3 international Journals.
- 14 invited talks, and 4 keynote lectures presented in international conferences.

- 4 patents have been published this year, 2 national and 2 international.
- Our researchers have been in the news, Dr. Nuno Peres, Dr. Jorge Jorge, and Dr. Vasco Teixeira have been invited to give interviews, to newspapers and TV channels.

### 1.3 Scientific Statistical data

	FAMO	FCD	FCT	FMNC	GRF	GCEP	OCV	TOTAL
Nº Effective Members with Ph.D.*	9	6	2	4	13	15	12	61
Nº Associate Members*	0	1	0	0	1	2	2	6
Nº Post-Docs*	4	1	2	2	1	0	1	11
Book Chapters	1	0	0	0	1	4	6	12
Regular Articles published in ISI Journals	8 <sup>5/6</sup>	41	3 <sup>5/6</sup>	9 <sup>1/6</sup>	21	28 <sup>2/3</sup>	21 <sup>1/2</sup>	134
Average Impact factor	2.79	2.04	3.13	2.06	1.92	3.73	2.09	2.5
Conference Proceedings published in ISI Journals	0	4	0	0	2	0	2	8
ISI Conference Proceedings published in Conference Books	1/2	1/2	0	0	1	0	0	2
Invited Talks in Scientific Conferences	2	0	2	0	11	8	8	31
PhD Theses concluded ( enrolled at ECUM / total )	0 1	4 6	0 0	2 2	1 3	0 0	1 2	8 14
PhD Theses in progress ( enrolled at ECUM / total ) *	6 6	10 <sup>1/2</sup> 20 <sup>1/2</sup>	2 <sup>1/2</sup> 2 <sup>1/2</sup>	3 3	5 <sup>1/2</sup> 15 <sup>1/2</sup>	3 5	9 <sup>1/2</sup> 10 <sup>1/2</sup>	40 63
Externally funded projects (FP7, FCT, ADI) **	5	4	0	1	8	5	5	28
Bilateral Cooperation Projects	1	0	0	0	2	1	0	4
Collaboration Projects with Industry	1	0	0	0	1	0	7	9
Patents (national/international)	1 1	1 0	0 0	0 0	0 0	0 0	0 1	2 2



#### 1.4 Funding

	2012 Dedicated funding	2012 Recieved funding	2012 Executed funding	Nº of projects
FCT Stratigec Project	383 900.00	129 787.69	227 000.00	1
FCT Projects	631 294.00	318 889.45	578 923.93	25
Other Projects (ADI, QREN,...)	9 525.11	67 100.00	15 000.00	1
Bilateral Projects	13 000.00	13 000.00	7 672.00	4
Intern Porj (FP7, ...)	22 201.00	2 693.05	75 612.00	2
Int. Indust. Projects	56 600.00	57 572.00	83 260.00	5
Nat. Indust. Projects	87 073.33	87 073.33	71 000.00	4
Total	1 203 593.44	676 115.52	1 058 467.93	42

## 1.5 Outreach and Dissemination Activities

### 1.5.1 Colloquia, Jornadas and Physics Seminars

**Jornadas do CFUM 2012**, occurred at the October 26<sup>st</sup> 2012 at the School of Science.

Organizers:

- Dr. Mikhail Vasilevskiy, Dr. Michael Belsley, and Dr. Bernardo Almeida

#### Physics Research Seminars – 2012

29<sup>th</sup> February - *Ivan Larkin* “*Visualisation of wave function of quantum dot at Fermi-edge singularity regime*”

23<sup>rd</sup> of March - *J. Fernández-Rossier* “*Atomic Scale Spintronics*”

20<sup>th</sup> of April - *J.-E. Wegrowe* “*Magnetization dynamics, gyromagnetic relation, and inertial effects*”

27<sup>th</sup> April - *Raphael Lopes* “*Analog of dynamical Casimir effect with matter waves*”

18<sup>th</sup> May - *Alexey Dronov* “*Ways to improve the efficiency of new generation solar cells through modifying the composition and morphology of titanium oxide layers*”

22<sup>nd</sup> May - *Jaime Santos* “*The probability distribution for the work performed by a rotating wave on a two-level system*”

22<sup>nd</sup> June - *C. Trallero-Giner* “*Elementary excitations of Bose-Einstein condensates*”

2<sup>nd</sup> July - *Marlos Viana* “*Symmetry Considerations in Statistical Optics*”

4<sup>th</sup> July - *Monica Garcia* “*Origin of the Pinning of Drifting Monostable Patterns*”

11<sup>th</sup> September - *Wolfgang Fritzsche* “*Bioanalytics using single plasmonic nanostructures*”

10<sup>th</sup> October - *Ivan Larkin* “*Magnetic Gradient’ edge magnetoplasmons in non-uniform magnetic field*”

16<sup>th</sup> October - *André Pasa* “*Normal versus anomalous roughening of electrodeposited Prussian Blue thin films*”

19<sup>th</sup> November - *Álvaro Damião* “*IEAv: Tecnologias para facilitar o acesso ao espaço*”

Organizer:

- Dr. Luis Vieira

#### Colloquia, talks directed to the general audience –

11<sup>th</sup> January – *Luis O. Silva* “*Plasma based accelerations and ultra compact particle and radiation sources*”

1<sup>st</sup> February – *Yasser Omar* – “*Criptografia Quântica*”

15<sup>th</sup> February – *Orfeu Bertolamy* “*O universo e as suas componentes escuras*”

14<sup>th</sup> March – *Jésus Pontos Just* “*Dinucreotídeos no olho e as suas implicações clínicas e terapêuticas*”

11<sup>th</sup> April – *Miguel Castelo-Branco* “*O instituto biomédico de investigação de luz e imagem (IBILI)*”

16<sup>th</sup> May – *J. J. Gómez-Cadenas* “*Un pedazo diminuto de realidad*”

13<sup>th</sup> June – *Sasha Sadewasser* “*Electronic and structural grain boundary properties of chalcopyrite solar cell materials*”

18<sup>th</sup> July – *Boaventura de Sousa Santos* “*A ciência e a ecologia dos saberes das sociedades contemporâneas*”

17<sup>th</sup> October – *Nuno Castro* “*O modelo padrão da Física das partículas*”

21st November – Rui Moreira “Em que condições podemos considerar uma nova teoria Física como uma emergência forte?”

12th November – Fernando Silva “Correção refrativa total na cirurgia à catarata”

Organizers:

- Dr. António Onofre, Dr. Jorge Jorge, Dr. Luis Marques (Spring), Dr. Luis Ribeiro, Dr. António Macedo, and Dr. Nuno Peres (Outumn).

### **1.5.2 Organization of Conferences and Workshops**

During the year 2012, members of the Center of Physics, have been committed to organize international Conferences and Workshops, as the ones mentioned below:

International Summer School on Advances in applications of Optica sans Photonics, Porto (M. F. Costa).

6<sup>th</sup> International Meeting on Development in Materials, Processes and Applications of Emerging Technologies, Alvor (V. Teixeira).

Annual International Congress on Optometry and Vision Science (CIOCV), Braga (J. M. Meijome, A. Queiros, J. Jorge).

Workshop on Correlations and Coherence in Quantum Systems, Évora (J. M. Carmelo, R. Ribeiro, M. Vasilevskiy).

1<sup>st</sup> Meeting of the European Branch (EurOK) of the International Association of Orthokeratology (J. G. Meijome).

1<sup>st</sup> International Summer School Recent Advances in Ophthalmic Optics and Optometry, Aveiro (M. F. Costa, A. Baptista).

9<sup>th</sup> International Conference – Hands-on-science, Antalya, Turkey (M. F. Costa).

## Research Groups

### 2.1 Optic, Molecular and Optical Physics

#### 2.1.1 Objectives

Preparation and characterization of SiO<sub>2</sub> and TiO<sub>2</sub> nanoparticles and aerogel. Surface functionalization and biomolecule incorporation for biological and energy conversion/storage applications.

Studies of the interaction with lipid membranes, DNA and membrane proteins of new potential antitumoral compounds by photophysical techniques.

Continuation of the the controlled syntheses of core/shell semiconductor nanoparticles, its deposition and self-organization as Langmuir-Blodgett films and its conjugation with proteins and benzo(a)thiazine.

Study of the transition from standard diffusion to anomalous diffusion, under linear multiple scattering conditions. Continuation of studies of coherent radiation transport in highly scattering media by implementing a new fiber optic based interferometry technique. Development of a second harmonic microscopy technique to study the nonlinear optical response of organic crystals embedded in the cores of individual nanofibers. Another area is focused on exploring new methods to produce and characterize graphene sheets.

#### 2.1.2. Achievements

- Studies of the potential of nanoliposomes as systems for the encapsulation, transport and delivery anti-tumor pharmaceuticals;
- Optimization of using DODAB based lipoplexes and mono-oleins as non-viral transfection systems;
- Development of two new ways to prepare single sheets of graphene;
- Development of a new microscopic technique to identify graphene deposited on a glass substrate;
- Development of two new experimental setups, one for fluorescence lifetime imaging microscopy (FLIM) using a femtosecond laser as excitation source and another one for the determination of two photon absorption coefficients of molecules in solution based on the Z-scan technique.

#### 2.1.3 Team

Group coordinator: Michael Belsley

Group	Física Atómica, Molecular e Ótica/ Optic, Molecular and Optical Physics
Coordinator	Michael Belsley
Research area	Biophysics, Molecular Physics, Spectroscopy, and Non-Linear Optics

Institution	Centro de Física, Universidade do Minho
Members	<p><b>Effective members</b></p> <p>Eduardo J. Nunes Pereira - – Assistant Professor  Elisabete MS Castanheira Coutinho - Professora Auxiliar  Julia B. Ayres de Campos Tovar – Assistant Professor  Maria Elisabete CD Real Oliveira - Associate Professor with Aggregation  Mário Rui C. Pereira – Assistant Professor  Maria Teresa R. Viseu – Assistant Professor  Michael Scott Belsley - Associate Professor with Aggregation  Paulo J. G. Coutinho – Assistant Professor  Peter Schellenberg - Researcher (Ciência 2007)</p> <p><b>Collaborators:</b></p> <p><i>Investigators with Phd:</i>  - Ana Sofia L. M. Abreu –FCT Post Doc (since 31st august 2012).  - Bachu Rama Raju - FCT Post Doc  -Flávio Ferreira - FCT Post Doc  -Luís Alves - FCT Post Doc</p> <p><i>Phd and other students:</i>  - M. Solange D. Carvalho –Phd Student (FCT)  - Arlindo M. F. Garcia – Phd Student  -Rosa Cristina Moutinho Ferreira – Phd Student (FCT)  - José Henrique R.S. Cachetas – Master Student Biofísica e Bionanossistemas.  – Pedro Miguel de Faria Mendes, Master Student Biofísica e Bionanossistemas.  – José Mário Ferreira Ramos, Master Student Biofísica e Bionanossistemas (Since October 2012).  – Cátia Natércia Campos Costa - Master Student Biofísica e Bionanossistemas (Since October 2012).  -João Paulo Neves Silva – Phd Student (FCT)  - Catarina Carneiro – Phd Student  - Ana Oliveira- - Phd Student (FCT)  - Ivo Lopes- – Master Student /Biofísica e Bionanossistemas.  - Fátima Alexandra Meira Machado- Master Student /Biofísica e Bionanossistemas (Since October 2012)  - Hugo José Fernandes Carvalho- Master Student /Biofísica e Bionanossistemas. (since October 2012)</p>

	<ul style="list-style-type: none"> <li>- José Castro – Master Student /Biofísica e Bionanossistemas.</li> <li>- Ana Catarina Correia – Master Student /Biofísica e Bionanossistemas.</li> <li>- Hugo Gonçalves - Master Student /Biofísica e Bionanossistemas. (Since October 2012)</li> <li>- César Bernardo - Master Student /Química Medicinal. (since October 2012)</li> <li>- Liliana Filipa S. Oliveira – BI grant (until september 30th 2012).</li> <li>- Ana Rita O. Rodrigues – Master Student Biofísica e Bionanossistemas (until 31 october de 2012) and Phd Student (since december 2012).</li> <li>- Isabel M. S. C. Oliveira – BI Grant (until june 30th 2012).</li> </ul>
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## 2.1.4 Publications

### Articles in international journals

Aggregation behavior of aqueous dioctadecyldimethylammonium bromide/monoolein mixtures: A multitechnique investigation on the composition and temperature

Isabel M. S. C. Oliveira, Joao P. N. Silva, Eloi Feitosa, Eduardo F. Marques, Elisabete M. S. Castanheira, M. Elisabete C. D. Real Oliveira

Journal of Colloid and Interface Science 374, 206-217, 2012. : () 000302446900027

Design, synthesis and evaluation of redox, second order nonlinear optical properties and theoretical DFT studies of novel bithiophene azo dyes functionalized with thiadiazole acceptor groups,

M. C. R. Castro, P. Schellenberg, M. Belsley, A. M. C. Fonseca, S. S. M. Fernandes, M. M. M. Raposo, Dyes and Pigments 95 392-399 (2012) : () 000307425100033

*Effect of oxygen pressure on the structural and magnetic properties of thin ZnO.98MnO.02O films* Khodorov, A.G. Rolo, E.K. Hlil, J. Ayres de Campos, O. Karzazi, S. Levichev, M.R. Correia, A. Chahboun and M.J.M. Gomes

Eur. Phys. J. Appl. Phys., 57 , 10301 (2012) : () 000298226800006. (Collaboration with FMNC, GCEP)

Interaction of antitumoral fluorescent heteroaromatic compounds, a benzothienopyrrole and two thienoin- doles, with DNA and lipid membranes

Ana S. Abreu, Elisabete M. S. Castanheira, Paulo J. G. Coutinho, Maria-Joao R. P. Queiroz, Paula M. T. Ferreira, Luís A. Vale-Silva, Eugenia Pinto

Journal of Photochemistry and Photobiology A: Chemistry, 240, 14-25, 2012. : () 000306616400003

New potential antitumoral di(hetero)arylether derivatives in the thieno[3,2-b]pyridine series: Synthesis and fluorescence studies in solution and in nanoliposomes

Maria-Joao R. P. Queiroz, Sofia Dias, Daniela Peixoto, Ana Rita O. Rodrigues, Andreia D. S. Oliveira, Paulo J. G. Coutinho, Luís A. Vale-Silva, Eugénia Pinto, Elisabete M. S. Castanheira

Journal of Photochemistry and Photobiology A: Chemistry 238, 71-80, 2012. : () 000305365400011

Platinum nanoparticles as pH sensor for intelligent packaging *J. Martins, M. Benelmekki, V. Teixeira, P. J. G. Coutinho* Journal of Nano Research 18-19, 97-104, 2012. : () 000309295700009 (Collaboration with GRF)

Quantitative investigations of quantum coherence for a light-harvesting protein at conditions simulating photosynthesis,  
Turner, DB; Dinshaw, R; Lee, KK; Belsley, M.; Wilk, KE; Curmi, PMG; Scholes, GD, Physical Chemistry Chemical Physics, 14 4857-4874 (2012) : () 000301494400023

Strong enhancement of second harmonic generation in 2-methyl-4-nitroaniline nanofibers, *Isakov, D; Gomes, ED; Belsley, MS; Almeida, B; Cerca, N,* NANOSCALE 4 4978-4982 ( 2012) : () 000306855500019 (Collaboratio with FCD)

Synthesis and characterization of novel second-order NLO-chromophores bearing pyrrole as an electron donor group  
Castro, MCR; Belsley, M; Fonseca, AMC; Raposo, TETRAHEDRON 68 8147-8155 ( 2012). : () 000308451500002

Synthesis of 2,6-bis-(oxazolyl)pyridine ligands for luminescent Ln(III) complexes *Goreti Pereira, Miguel F. Ferreira, Elisabete M. S. Castanheira, Jose A. Martins, Paula M.T. Ferreira* European Journal of Organic Chemistry 2012, 3905-3910, 2012: () 000306290400002

*Synthesis, structure and non-linear optical properties of L-argininium perrhenate crystal,* Isakov, D; Gomes, ED; Belsley, MS; Rodrigues, VH; Costa, MMR, CRYSTENGCOMM 14 ,3767-3771 (2012). : () 000303168700058 (Collaboration with FCD)

### **International Conference Proceedings**

Ruminations on the Effect of MeV Si<sup>8+</sup> and Ag<sup>8+</sup> Ion Irradiation on Nonlinear Optical L-Valinium Picrate Single Crystals, P. Srinivasan, R. Nagalakshmi, D. Isakov, E.M. Gomes, M.S. Belsley, S Prabu, Eds: B AriWahjoedi, R Razali, M Narahari, International Conference on Fundamental and Applied Sciences (ICFAS2012), Kuala Lumpur, Malaysia, Jun 12-14, 2012; AIPConference Proceedings, 1482, 695-700 (2012) : () 310513300134

### **Book Chapters**

Development of Dioctadecyldimethylammonium Bromide/Monoolein Liposomes for Gene Delivery, *J. P. Neves Silva, A. C. N. Oliveira, A. C. Gomes and M. E. C. D. Real Oliveira* Cell Interaction, Chapter 10, ISBN, Sivakumar Gowder (Ed.): 978-953-51-0792-7, InTech, : () 10.5772/48603

## 2.1.5 Presentations

### Poster presentations in international conferences

Efficient graphene preparation by combined intercalation - exfoliation steps *presented by Peter Schellenberg*, Graphene 2012, — Brussels, Belgium.

Controlled release of volatile compounds from polymeric capsules mediated by photocatalytic materials, *presented by Paulo Josié Gomes Coutinho*  
SPEA7 - 7th European Meeting on Solar Chemistry and Photocatalysis: Environmental Applications, — Porto (Portugal),.

Dioctadecyldimethylammonium Bromide or Chloride/Monoolein liposomes for gene delivery, *presented by Elisabete Oliveira*, 8th NanoBio-Europe conference, — Varese,

CdSe quantum dots using polyselenide precursor in soft chemical conditions, *presented by Paulo Josié Gomes Coutinho*, XXIV IUPAC Symposium on Photochemistry, — Coimbra (Portugal),.

DNA fluorescence probes based on side-chain chlorinated benzo[a]phenoxazinium chlorides, *presented by Paulo Josié Gomes Coutinho*, XXIV IUPAC Symposium on Photochemistry, — Coimbra (Portugal), .

Fluorescence studies on new potential antitumoral 1,3-diarylurea derivatives in the thieno[3,2-b]pyridine series encapsulated in magnetoliposomes, presented by Paulo Josié Gomes Coutinho XXIV IUPAC Symposium on Photochemistry

Fluorescence studies of 2-quinolinones and coumarins including peptide derivatives in solution and in lipid membranes, presented by Elisabete Coutinho, XXIV IUPAC Symposium on Photochemistry, — Coimbra (Portugal),

Fluorescence studies of potential antitumoral 6-heteroarylthieno[3,2-b]pyridines in solution and in nanoli- posomes, presented by, XXIV IUPAC Symposium on Photochemistry, Coimbra (Portugal), — Coimbra (Portugal),

### Presentations in national conferences

Method of Monte Christo in Physics: New polar phenomena in electrospun nanofibers *presented by Dmitry Isakov*, Jornadas de Física da Universidade do Minho — Braga, Portugal

The Femtosecond Laser Lab: Experiments, Perspectives and Challenges *presented by Peter Schellenberg*, Jornadas de Física da Universidade do Minho — Braga, Portugal

## 2.1.6 Academic Training

### PhD Theses

Preparação e caracterização fotofísica de nanopartículas semicondutoras de tipo núcleo/coroa por moldagem com meios microheterogíneos, Arlindo Miguel Fonte Garcia , (on-going)

Caracterização físico-química de liposomas catiónicos DNA e o estudo do seu potencial como vectores não-virais, Joao Paulo Neves da Silva, (on-going)

Novos compostos heterocíclicos bioactivos fluorescentes: síntese, estudos fotofísicos de interação com ADN e membranas lípidas e ensaios de libertação controlada usando nanolipossomas, Maria Solange D. Carvalho , (on-going)

Development of Monoolein-based lipofection vectors for therapeutic siRNA delivery, Ana C. Oliveira, (on-going)

Cationic liposomes as antigenic delivery systems: development of an immunoprotective strategy against fungal infections, Catarina Carneiro, (on-going)

Innovative Two-Photon Absorbing (TPA) chromophores as sensors, photo-initiators or data storage elements: design, synthesis and development for applications, Rosa Cristina Moutinho Ferreira, (on-going)

Force distribution in the mitotic spindle and regulation of chromosome dynamics during cell division Antonio Jose Pereira, (on-going)

### 2.1.7 Group Summary

	number
Articles in international journals	11
International Conference Proceedings	1
Book Chapters	1
Poster presentations in international conferences	8
Presentations in national conferences	2

## **2.2 Cooperative Phenomena in Dielectrics Group**

### **2.2.1 Objectives**

Syntheses and structural, dielectric and non-linear optical characterization of novel nanofibers composed by organic and semi-organic materials.

Study of the influence of the magnetic ordering on the dielectric properties of multiferroic manganite ceramics and thin films.

Study of the frequency dependent dielectric properties of electrophoretic deposited multiferroic (piezoelectric- magnetostrictive) composite films.

Understanding the relationship between the structure, morphology and electromechanical response of piezo-electric polymers and polymer based composites.

### **2.2.2 Achievements**

Determination of the conditions for stabilization of incommensurate magnetic phases using symmetry arguments and its application to multiferroic manganites such as of  $\text{RMnO}_3$ ;

- Development of infrared spectra modeling method for polycrystalline materials;
- Electrospinning synthesis of micro- and nanofiber materials with ferroelectric and nonlinear optical properties ( $\text{BaTiO}_3$ , MNA); study of their domain structure and nonlinear optical response;
- Synthesis of micro- and nanofiber piezoelectric materials (PLLA, PEO-PLLA, PVDF-TFE);
- Spectroscopic characterization of multiferroic composite films; magnetic and transport characterization of CO and CMR films on PMN-PT; structural, magnetic and piezoelectric characterization of PVDF based multiferroic composites;
- Synthesis and structural, mechanical, dielectric and piezoelectric characterization of composites containing carbon nanotubes, zeolites or ferroelectric particles dispersed in PVDF.

### 2.2.3 Team

Group coordinator: Bernardo Almeida

Group	Fenómenos Cooperativos em Dielétricos /Cooperative Phenomena in Dielectrics
Coordinator	Bernardo Gonçalves Almeida
Research area	Nanomaterials, Physics in condensed matter, Science of materials
Institution	Centro de Física da Universidade do Minho

Members	<p><b>Effective Members:</b></p> <p>Bernardo Gonçalves Almeida - Assistant Professor  Dmitry V. Isakov– Researcher (Ciência 2007)  Etelvina de Matos Gomes - Associate Professor  José Luís Ribeiro – Associate Professor with Agregation  Luis Manuel Gomes Vieira - Assistant Professor  Senen Lanceros-Mendéz - Associate Professor</p> <p><b>Associate Members:</b></p> <p>Jorge António Silva Mendes, teaching staff, Instituto Politécnico do Porto</p> <p><b>Collaborators:</b></p> <p><i>Investigators with Phd:</i>  Vitor Sencadas – FCT Post-Doc grant</p> <p><i>Phd and other students:</i>  José Barbosa - PhD student (FCT)  Isabel Tarroso Gomes - PhD student (FCT)  Sérgio Mendes, PhD student (FCT)  Paulo Cardoso, PhD student (FCT)  João Machado, PhD student (FCT)  Susana Catarino, PhD student (FCT)  Gabriel Mendes, PhD student (FCT)  Juan Alberto Panadero, PhD student (FCT)  Paulo Sousa - PhD student (FCT)  Clarisse Ribeiro - PhD student (FCT)  Silvia Reis - PhD student (FCT)  Jaime Silva - PhD student (FCT)  Catarina Lopes - PhD student (FCT)  Armando Ferreira - PhD student (FCT)  Carlos Costa - PhD student (FCT)  João Pereira - PhD student (FCT)  Pedro Costa - PhD student (FCT)  Pedro Martins - PhD student (FCT)  Vanessa Cardoso - PhD student (FCT)  Vitor Correia - PhD student (FCT)  Helder Castro - PhD student (FCT)  Marco Silva - PhD student (FCT)  Daniela Correia - PhD student (FCT)  Vania Pinto- PhD student (FCT)  Joana Oliveira - PhD student (FCT)  Ricardo Sousa - PhD student (FCT)  Pedro Sá - FCT Grant (BI)  Anabela Areias – FCT Grant (BI)  José Carlos Ferreira – FCT Grant (BI)</p>
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## 2.2.4 Publications

### Articles in international journals

Assessment of parameters influencing fiber characteristics of chitosan nanofiber membrane to optimize fiber mat production; AC Areias, JA Gomez-Tejedor, V Sencadas, J Alio, JL Gomez Ribelles, S Lanceros-Mendez POLYMER ENGINEERING AND SCIENCE 52, 1293-1300 (2012) : () 000304091300014

Bi<sub>2</sub>Te<sub>3</sub>-Sb<sub>2</sub>Te<sub>3</sub> on polymeric substrate for X-ray detectors based on the seebeck effect *J. G Rocha, L. M. Goncalves, S. Lanceros-Mendez* MICROSYSTEM TECHNOLOGIES-MICRO-AND NANOSYSTEMS-INFORMATION STORAGE AND PROCESSING SYSTEMS 18, 1-8 (2012) : () 000301638400001

Comparative analyses of the electrical properties and dispersion level of VGCNF and MWCNT: Epoxy composites  
P Cardoso, J Silva, MC Paiva, F van Hattum, S Lanceros-Mendez  
JOURNAL OF POLYMER SCIENCE PART B-POLYMER PHYSICS 50, 1253-1261 (2012) : () 000306956600005

*Comparative X-ray diffraction and infrared spectroscopic studies of Zn-Al layered double hydroxides*, A.N. Salak, J. Tedim, A. I. Kuznetsova, JL Ribeiro, LG Vieira, M. L. Zheludkevich, M. G. S. Ferreira Chem. Physics 397, 102-108 (2012) : () 000301125700015

Correlation between Crystallization Kinetics and Electroactive Polymer Phase Nucleation in Fer- rite/Poly(vinylidene fluoride) Magnetolectric Nanocomposites  
P Martins, CM Costa, JCC Ferreira, S Lanceros-Mendez  
JOURNAL OF PHYSICAL CHEMISTRY B 116, 794-801 (2012) : () 000299584500007

Critical behavior of a three-dimensional hardcore-cylinder composite system *J Silva, R Simoes, S Lanceros-Mendez*, PHYSICAL REVIEW E 85, 021115 (2012) : () 000300095900003

Design and characterization of Ni<sup>2+</sup> and Co<sup>2+</sup> decorated Porous Magnetic Silica spheres synthesized by hydrothermal-assisted modified-Stober method for His-tagged proteins separation,  
M. Benelmekki, E. Xuriguera, C. Caparros, E. Rodriguez-Carmona, R. Mendoza, J. L. Corchero, S. Lanceros-Mendez, Ll. M. Martinez, Journal of Colloid and Interface Science, 365 (1), 156-162, 2012. : () 000296401300021. (Collaboration with GRF)

*Dielectric and magnetic properties of ferrite/poly(vinylidene fluoride) nanocomposites* P Martins, CM Costa, G Botelho, S Lanceros-Mendez, JM Barandiaran, J Gutierrez MATERIALS CHEMISTRY AND PHYSICS 131, 698-705 (2012) : () 000300120600019

Effect of degree of porosity on the properties of poly(vinylidene fluoride-trifluorethylene) for Li-ion battery separators  
CM Costa, LC Rodrigues, V Sencadas, MM Silva, JG Rocha, S Lanceros-Mendez JOURNAL OF MEMBRANE, SCIENCE 407, 193-201 (2012) : () 000303635800020

Effect of filler dispersion on the electromechanical response of epoxy/vapor-grown carbon nanofiber composites, A. Ferreira, P. Cardoso, D. Klosterman, J.A. Covas, F.W.J. van Hattum, F. Vaz, S. Lanceros-Mendez, Smart Materials and Structures 21 (2012) 075008. : () 000306002100008. (Collaboration with GRF)

Effect of filler size and concentration on the structure and properties of poly(vinylidene fluoride)/BaTiO<sub>3</sub> nanocomposites

SF Mendes, CM Costa, C Caparros, V Sencadas, S Lanceros-Mendez

JOURNAL OF MATERIALS SCIENCE 47, 1378-1388 (2012) : () 000299104300033

Effect of the microstructure and lithium-ion content in poly[(vinylidene fluoride)-co-trifluoroethylene]/lithium perchlorate trihydrate composite membranes for battery applications

CM Costa, LC Rodrigues, V Sencadas, MM Silva, S Lanceros-Mendez

SOLID STATE IONICS 217, 19-26 (2012)<http://hdl.handle.net/> : () 000306028900004

Electrical and thermal behavior of gamma-phase poly(vinylidene fluoride)/NaY zeolite composites AC Lopes, C Caparros, JL Gomez Ribelles, IC Neves, S Lanceros-Mendez

MICROPOROUS AND MESOPOROUS MATERIALS 161, 98-105 (2012) : () 000307085900013

Electroactive Poly(Vinylidene Fluoride-Trifluoroethylene) (PVDF-TrFE) Microporous Membranes for Lithium-Ion Battery Applications

CM Costa, A California, VF Cardoso, V Sencadas, LC Rodrigues, MM Silva, S Lanceros-Mendez

FERROELECTRICS 430, 103-107 (2012) : () 000305516400017

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Ferreira, J.G. Rocha, A. Anson-Casaos, M.T. Martinez, F. Vaz, S. Lanceros-Mendez, Sensors and Actuators A 178, 10- 16, 2012. : () 000303087800002 (Collaboration with GRF)

Enhanced proliferation of pre-osteoblastic cells by dynamic piezoelectric stimulation, C. Ribeiro, S. Moreira, V. Correia, V. Sencadas, J.G Rocha., F.M Gama., J.L. Gomez Ribelles, S. Lanceros-Mendez, RSC Advances 2 (30), 11504-11509 (2012) : () 312145400047

Effect of Zeolite Content in the Electrical, Mechanical and Thermal Degradation Response of Poly(vinylidene fluoride)/NaY Zeolite Composites

AC Lopes, R Goncalves, CM Costa, AM Fonseca, G Botelho, IC Neves, S Lanceros-Mendez

JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY 12, 6804-6810 (2012) : () 000308379900108

Fabrication of Poly(lactic acid)-Poly(ethylene oxide) Electrospun Membranes with Controlled Micro to Nanofiber Sizes

C Ribeiro, V Sencadas, C Caparros, JL Gomez Ribelles, S Lanceros-Mendez

JOURNAL OF NANOSCIENCE AND NANOTECHNOLOGY 12, 6746-6753 (2012) : () 000308379900099

*Ferroelectric-Paraelectric Phase Transition in Triglycine Sulphate via Piezoresponse Force Microscopy*, Bdikin, M. Wojta?, D. Kiselev, D. Isakov, A. Kholkin, Ferroelectrics, 426, 215 (2012). : () 000304266300029

Fiber average size and distribution dependence on the electrospinning parameters of poly(vinylidene fluoride-trifluoroethylene) membranes for biomedical applications V Sencadas, VC Ribeiro, J Nunes-Pereira, V Correia, S Lanceros-Mendez APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING 109, 685-691 (2012) : () 000310316800025

Fibronectin adsorption and cell response on electroactive poly(vinylidene fluoride) films

C Ribeiro, JA Panadero, V Sencadas, S Lanceros-Mendez, MN Tamano, D Moratal, M Salmeron-Sanchez, JL Gomez Ribelles

BIOMEDICAL MATERIALS 7, 035004 (2012) : () 000303667600004

Hydrothermal assisted synthesis of iron oxide-based magnetic silica spheres and their performance in magnetophoretic water purification,

C. Caparros, M. Benelmekki, P. M. Martins, E. Xuriguera, C. J. R. Silva, Li. M. Martinez, S. Lanceros- Mendez, Materials Chemistry and Physics, 135, 510-517, 2012. : () 000309247500040 (Collaboration with GRF)

Improving the optical and electroactive response of poly(vinylidene fluoride-trifluoroethylene) spin-coated films for sensor and actuator applications

VF Cardoso, CM Costa, G Minas, S Lanceros-Mendez

SMART MATERIALS AND STRUCTURES 21, 085020 (2012) : () 000306713800021

Influence of crystallinity and fiber orientation on hydrophobicity and biological response of poly(L-lactide) electrospun mats

AC Areias, C Ribeiro, V Sencadas, N Garcia-Giralt, A Diez-Perez, JLG Gomez Ribelles, S Lanceros- Mendez

SOFT MATTER 8, 5818-5825 (2012) : () 000303863700014

Influence of fiber diameter and crystallinity on the stability of electrospun poly(L-lactic acid) membranes to hydrolytic degradation JC Dias, C Ribeiro, V Sencadas, G Botelho, JL Gomez Ribelles, S Lanceros-Mendez POLYMER TESTING 31, 770-776 (2012) : () 000307614000009

Influence of filler size and concentration on the low and high temperature dielectric response of poly(vinylidene fluoride)/Pb(Zr<sub>0.53</sub>Ti<sub>0.47</sub>)O<sub>3</sub> composites

SF Firmino Mendes, CM Costa, R Sabater i Serra, A Andrio Baldalo, V Sencadas, JL Gomez-Ribelles, R Gregorio, S Lanceros-Mendez, JOURNAL OF POLYMER RESEARCH 19, 9967 (2012) : () 000308540500004

Infrared anisotropy averaging in polycrystalline samples and resonant scattering: the example of YMnO<sub>3</sub> L. G. Vieira, J. L. Ribeiro, O. Santo, P. B. Tavares;

Journal of Optics 14, 045707 (2012) : () 000302775900019

Local piezoelectric activity of single poly(L-lactic acid) (PLLA) microfibers V Sencadas, C Ribeiro, A Heredia, IK Bdikin, AL Kholkin, S Lanceros-Mendez APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING 109, 51-55 (2012) : () 000309224600008

Magnetic superspace groups and symmetry constraints in incommensurate magnetic phases, J. M. Perez-Mato, J. L. Ribeiro, V. Petricek, M. I. Aroyo, J. Physics: Cond. Matter (topical review) 24, 163201 (2012) : () 000302559200006

Nanoparticle Dispersion and Electroactive Phase Content in Polyvinylidene Fluoride/Ni<sub>0.5</sub>Zn<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> Nanocomposites for Magnetoelectric Applications

P. Martins, C. M. Costa, M. Benelmekki, S. Lanceros-Mendez

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Optimization of piezoelectric ultrasound emitter transducers for underwater communications *M Martins, V Correia, JM Cabral, S Lanceros-Mendez, JG Rocha* SENSORS AND ACTUATORS A-PHYSICAL 184, 141-148 (2012) : () 000308452200021

Piezoresistive effect in spin-coated polyaniline thin films, J Nunes Pereira, P Vieira, A Ferreira, AJ Paleo, JG Rocha, S Lanceros-Mendez *JOURNAL OF POLYMER RESEARCH* 19, 9815 (2012) : () 000300929600007

Piezoresistive polypropylene-carbon nanofiber composites as mechanical transducers *AJ Paleo, FWJ van Hattum, JG Rocha, S Lanceros-Mendez*, *MICROSYSTEM TECHNOLOGIES-MICRO-AND NANOSYSTEMS-INFORMATION STORAGE AND PROCESSING SYSTEMS* 18, 591-597 (2012) : () 000304112300007

Piezoresistive response of Pluronic wrapped single wall carbon nanotube D epoxy composites, J.M. Gonzalez-Dominguez, A. Anson-Casaos, M. T. Martinez, A. Ferreira, F. Vaz, S. Lanceros-Mendez, *Journal of Intelligent Material Systems and Structures* 23 (8), 909-917, 2012. : () 000303812100005 (Collaboration with GRF)

Porous Membranes of Montmorillonite/Poly(vinylidene fluoride-trifluoroethylene) for Li-Ion Battery Separators, J Nunes-Pereira, AC Lopes, CM Costa, R Leones, MM Silva, S Lanceros-Mendez *ELECTROANALYSIS* 24, 2147-2156 (2012) : () 000310684600016

*Production and PFM Characterization of Barium Titanate Nanofibers*, P. Sá, I. Bdiqin, B. Almeida, A.G. Rolo, and D. Isakov, *Ferroelectrics*, 429:1 48-55, (2012). : () 000305953800008 (Collaboration with GCEP)

Quantitative evaluation of the dispersion achievable using different preparation methods and DC electrical conductivity of vapor grown carbon nanofiber/epoxy composites, P Cardoso, D Klosterman, JA Covas, FWJ van Hattum, S Lanceros-Mendez *POLYMER TESTING* 31, 697-704 (2012) : () 000306028000016

Relaxation dynamics of poly(vinylidene fluoride) studied by dynamical mechanical measurements and dielectric spectroscopy, V Sencadas, S Lanceros-Mendez, RSI Sabater i Serra, AA Balado, JL Gomez Ribelles, *EUROPEAN PHYSICAL JOURNAL E* 35, 41 (2012) : () 000304886200001

Reversible Aggregation and Chemical Resistance of Magnetic Nanoclusters for Their Recycling and Repetitive Use in Industrial Bioprocesses, C. Caparros, M. Benelmekki, A. Montras, S. Lanceros-Mendez, LI. Martinez, *Journal of Nanoscience and Nanotechnology*, 12 (8), 6707-6711, 2012. : () 000308379900092

Role of Nanoparticle Surface Charge on the Nucleation of the Electroactive beta-Poly(vinylidene fluoride) Nanocomposites for Sensor and Actuator Applications,

P. Martins, C. Caparros, R. Goncalves, P. M. Martins, M. Benelmekki, G. Botelho, S. Lanceros-Mendez, *Journal of Physical Chemistry C*, 116 (29), 15790-15794, 2012. : () 000306725200072 (Collaboration with GRF)

Room temperature magnetic response of sputter deposited TbDyFe films as a function of the deposition parameters, L. Rebouta, P. Martins, S. Lanceros-Mendez, J. M. Barandiaran, J. Gutierrez, L. C. Alves and E. Alves, *Journal of Nano Research*, 18-19, 235-239, 2012. : () 000309295700024 (Collaboration with GRF)

Simple way to make Anatase TiO<sub>2</sub> films on FTO glass for promising solar cells, T. Raghavender, A. P. Samantilleke, Pedro Sa, B. G. Almeida, M. I. Vasilevskiy, and Nguyen Hoa Hong, *Materials Letters* 69, p. 59-62, (2012). : () 000300190300018 (Collaboration with GCEP)

Strong enhancement of second harmonic generation in 2-methyl-4-nitroaniline nanofibers, Isakov, D; Gomes, ED; Belsley, MS; Almeida, B; Cerca, N, *NANOSCALE* 4 4978-4982 ( 2012) : () 000306855500019 (Collaboration with FAMO)

*Suitability of PLLA as piezoelectric substrates for tissue engineering evidenced by microscopy techniques* NB Barroca, AL Daniel-da-Silva, PS Gomes, MHR Fernandes, S Lanceros-Mendez, P Sharma, A Gruverman, MHV Fernandes, PM Vilarinho *MICROSCOPY AND MICROANALYSIS* 18, 63-64 (2012) : () 000309744500032

*Synthesis, structure and non-linear optical properties of L-argininium perrhenate crystal*, Isakov, D; Gomes, ED; Belsley, MS; Rodrigues, VH; Costa, MMR, *CRYSTENGCOMM* 14 ,3767-3771 (2012). : () 000303168700058 (Collaboration with FAMO)

Temperature dependence of the electrical conductivity of vapor grown carbon nanofiber/epoxy composites with different filler dispersion levels, P Cardoso, J Silva, JA Agostinho Moreira, D Klosterman, FWJ van Hattum, R Simoes, S Lanceros- Mendez, *PHYSICS LETTERS A* 376, 3290-3294 (2012) : () 000311865500087

The effect of nanotube surface oxidation on the electrical properties of multiwall carbon nano- tube/poly(vinylidene fluoride) composites  
SAC Carabineiro, MFR Pereira, J Nunes-Pereira, J Silva, C Caparros, V Sencadas, S Lanceros-Mendez *JOURNAL OF MATERIALS SCIENCE* 47, 8103-8111 (2012) : () 000308726500017

The role of disorder on the AC and DC electrical conductivity of vapour grown carbon nanofibre/epoxy composites, P Cardoso, J Silva, D Klosterman, JA Covas, FWJ van Hattum, R Simoes, S Lanceros-Mendez, *COMPOSITES SCIENCE AND TECHNOLOGY* 72, 243-247 (2012) : () 000300648000015

Thermal Properties of Electrospun Poly(Lactic Acid) Membranes  
V Sencadas, CM Costa, G Botelho, C Caparros, C Ribeiro, JL Gomez-Ribelles, S Lanceros-Mendez *JOURNAL OF MACROMOLECULAR SCIENCE PART B-PHYSICS* 51, 411-424 (2012) : () 000301886200036

## International Conference Proceedings

Modeling and simulation of acoustic propagation for mixing and pumping fluids in lab-on-a-chip devices,  
S.O. Catarino, J.M. Miranda, S. Lanceros-Mendez, G. Minas,  
IEEE 2nd Portuguese Meeting in Bioengineering, ENBENG 2012, art. no. 6331359 : ()  
00031043100022  
(PP)

Modeling and Simulation of Acoustic Propagation for Mixing and Pumping Fluids in Lab-on-a-Chip Devices,  
S.O. Catarino, J.M. Miranda, S. Lanceros-Mendez, G. Minas,  
Book Group Author(s): IEEE 2nd IEEE Portuguese Meeting in Bioengineering (ENBENG), Coimbra, PORTUGAL, FEB 23-25, 2012, Source: 2012 IEEE 2ND PORTUGUESE MEETING IN BIOENGINEERING (ENBENG) (2012) : () 00031043100022 (PP)

Ruminations on the Effect of MeV Si<sup>8+</sup> and Ag<sup>8+</sup> Ion Irradiation on Nonlinear Optical L-Valinium Picrate Single Crystals, P. Srinivasan, R. Nagalakshmi, D. Isakov, E.M. Gomes, M.S. Belsley, S Prabu, Eds: B AriWahjoedi, R Razali, M Narahari,  
International Conference on Fundamental and Applied Sciences (ICFAS2012), Kuala Lumpur, Malaysia, Jun 12-14, 2012; AIPConference Proceedings, 1482, 695-700 (2012) : () 310513300134

### 2.2.5 Presentations

#### Oral presentations in international conferences

Porous membranes of carbon nanotubes/poly(vinylidene fluoride-trifluorethylene) for Li-ion battery separators. presented by Senen Lanceros-Míendez, COINAPO 2012, — Rehovot, Israel,

Thermal behaviour and hydration dynamics of layered double hydroxide Zn-Al pyrovanadate,  
*presented by Luís Vieira*, Functional Materials and NanoTechnologies , — Riga, Latvia

Electrospinning facilitates efficiency in nanofibers, *presented by Bernardo Almeida*  
Electrospin 2012, — Jeju, Korea. .

Enhancement of the second harmonic generation efficiency of organic nanofibers,  
*presented by Dmitry Isakov*, E-MRS Spring Meeting, — Strasbourg, France

Mechanical, electrical and electro-mechanical properties of thermoplastic elastomer SBS/CNT composites for large strain sensor applications, presented by Senen Lanceros-Míendez  
Electromechanically Active Polymer (EAP) transducers & artificial muscles, — Potsdam (Berlin), Germany,

Linear Direct Magnetoelectric Response in CoFe<sub>2</sub>O<sub>4</sub>/ PVDF 0-3 Nanocomposites, *presented by Senen Lanceros-Míendez*, CIMTEC 2012, — Montecatini Terme, Italy, .

Enhanced Polar Properties of Electrospun Nanofibers of Organic Molecular Crystals *presented by Etelvina de Matos Gomes*, MOLMAT 2012 — Barcelona

Influence of nanoparticles dispersion in the Magnetoelectric Response of CoFe<sub>2</sub>O<sub>4</sub>/P(VDF-TrFE) nano- composites, *presented by Senen Lanceros-Míendez*, ISAF ECAPD PFM 2012, — Aveiro, Portugal

Stress mediated coupling on BaTiO<sub>3</sub>/CoFe<sub>2</sub>O<sub>4</sub> composite films, *presented by Bernardo Almeida*  
ISAF-ECAPD, — Aveiro, .

Structural characterization and ferroelectric properties of the barium titanate nanofibers, *presented by Dmitry Isakov*, International Symposium on Applications of Ferroelectrics, — Aveiro, Portugal

Physical properties of cross-linked chitosan electrospun fiber mats, *presented by Vitor Joao Gomes da Silva Sencadas*, 7th Modification Degradation and Stabilization Conference (Modest), — Praga, República Checa,

Electrophoretic Deposition of CoFe<sub>2</sub>O<sub>4</sub> nanograins dispersed in a BaTiO<sub>3</sub> matrix, *presented by Cacilda Maria Lima de Moura*, International Workshop on Electrodeposited Nanostructures (EDNANO 9) EDNANO2012, — Porto, .

Underwater communications using Ultrasounds, Workshop, *presented by Senen Lanceros-Míendez*  
I Workshop ON Ultrasound and Applications, — Universidade de Aveiro

## **Poster presentations in international conferences**

Influence of zeolite Si/Al ratio and cavity shape and size on the electrical response of poly(vinylidene fluoride)/zeolite composites, *presented by Stanislav Ferdov*  
International Symposium on Applications of Ferroelectrics; International Symposium on Piezoresponse Force Microscopy & Nanoscale Phenomena in Polar Materials, 2012, — Aveiro, Portugal.

Microporous poly(vinylidene fluoride trifluoroethylene)/zeolite membranes for lithium-ion battery applications. *presented by Senen Lanceros-Míendez* Euromembrane — Londres, Inglaterra.

Solid polymer electrolytes based on poly(vinylidene fluoride-trifluoroethylene)/poly(ethylene oxide) blend membranes for lithium ion battery applications. *presented by Senen Lanceros-Míendez* ISPE-13, Selfoss, — Islandia, .

Local Piezoelectric response of a Single Poly(vinylidene Fluoride) Electrospun Fiber, *presented by Vitor Joao Gomes da Silva Sencadas*, Materials Today Virtual Conference: Materials Today Virtual Conference: The Frontiers of Microscopy

Tailoring electroactive electrospun membranes for energy applications, *presented by Vitor João Gomes da Silva Sencadas*, Electrospinning2012: principles, possibility and practices, — London (UK),

Electrospun membranes for tissue regeneration applications, Electrospinning, principles, possibilities and practice, presented by Vitor João Gomes da Silva Sencadas — Londres, .

Synthesis, structural characterization and ferroelectric properties of the barium titanate nanofibers, *presented by Dmitry Isakov*, E-MRS 2012 Spring Meeting, — Strasbourg, France

Structural and Raman properties of Barium Titanate nanofibers, *presented by Dmitry Isakov* Nano TP Meeting, — Aveiro, Portugal .

Estruturas porosas de poli(fluoreto de vinilideno-trifluoretileno), P(VDF-TrFE) para baterias de iões de lítio, presented by Senen Lanceros-Mendez II ETCAQ, — Braga, .

Influence of Crystallinity and Fiber Orientation on Hydrophobicity and Biological Response of Poly(L- lactide) Electrospun Mats. presented by Vitor João Gomes da Silva Sencadas, 4<sup>a</sup> International Conference Smart Materials Structures Systems, Montecatini Terme

Optimization of Laminated magnetoelectric structures based on electroactive polymers, *presented by Senen Lanceros-Mendez*, Encuentros Paris 2012, — Paris-France,

Synthesis of Fe<sub>3</sub>O<sub>4</sub> nanoparticles and its influence on the nucleation of the electroactive PVDF *fi*-phase, dielectric and magnetic response, presented by Maria Benelmekki Erretby, 21st International Symposium on Applications of Ferroelectrics (ISAF 2012), — University of Aveiro, Portugal,.

Poly(vinylidene fluoride-trifluoroethylene)/ lithium perchlorate trihydrat composite membranes for lithium ion battery applications, presented by Vitor João Gomes da Silva Sencadas ISPE-13, — Selfoss

*Properties of cross-linked chitosan electrospun fiber mats*, presented by Vitor João Gomes da Silva Sencadas Modest 2012, — Prague (Czech Republic), .

Pr<sub>0.5</sub>Ca<sub>0.5</sub>MnO<sub>3</sub> thin films deposited on LiNbO<sub>3</sub> substrates,I.T. *presented by Bernardo Almeida* Joint European Magnetic Symposia JEMS 2012, — Parma, Italy, .

Processing and electrical response of fully polymer piezoelectric filaments for e-textiles applications, *presented by Senen Lanceros-Mendez*, TRS 2012, The 41st Textile Research Symposium, — Guimarães, Portugal, .

Structural, electrical and optical characterization of NiO films produced by laser ablation for organic photo-voltaic solar cell applications, presented by Luís Silvino Alves Marques, 13th International Conference on Plasma Surface Engineering - PSE2012 — Garmisch-Partenkirchen, Germany .

Comparing performance of solid polymer electrolytes based on poly (vinylidene fluoride-trifluoroethylene) obtained by different processing techniques, presented by Senen Lanceros-Mendez Euromembranes 2012, — Londres

*Training School on Dielectric Electroactive Polymers*, presented by Vitor Joao Gomes da Silva Sencadas ESNAM, — Neuchatel (Swiss), .

Energy harvesting performance of piezoelectric electrospun and spin-coated polymer ceramic composites, Tailoring electroactive electrospun membranes for energy, presented by Vitor Joao Gomes da Silva Sencadas, Materials Today Virtual Conference: Materials Today Virtual Conference: Nanotechnology,

## **Presentations in national conferences**

- Overview of Advanced Materials Science session, MAP-FIS Research Conference — .
- *Electroactive polymers for Biomedical Applications*. presented by Vitor Joao Gomes da Silva Sencadas Jornadas de Engenharia Biomedica — Braga,.
- Extrusion of piezoelectric filaments *presented by Senen Lanceros-Mendez* IV Annual Meeting — Quiaios, Portugal.
- Estudo de Sistemas Binários Baseados em Poli(fluoreto de vinilideno-trifluoretileno) para implementação em separadores de baterias de íons de Lítio, presented by Senen Lanceros-Mendez Física 2012 — Aveiro,.
- Electroactive Smart Materials Group *presented by Senen Lanceros-Mendez* Workshop UMinho-Empresas sobre Dispositivos Medicos — Guimarães.
- Electrospun poly(hydroxybutyrate) membranes for tissue engineering applications *presented by Vitor Joao Gomes da Silva Sencadas*, — Universidade de Trás-os-Montes e Alto Douro, Vila Real.

## 2.2.6 Academic Training

### PhD Theses

Efeito do tamanho de grão e concentração de ceramic em compósitos de Poli (fluoreto de Vinili- deno)/cerâmico

Sergio Firmino Soares Mendes, 2012-07-31

Processing and characterization of piezoelectric polymers for tissue engineering applications *Clarisse Marta de Oliveira Ribeiro, 2012-11-30*

Magnetolectric nanocomposites based on electroactive polymers *Pedro Libânio de Abreu Martins, 2012-12-31*

"Lab-on-chip" para análises bioquímicas de fluídos biológicos baseado em polímeros electroactivos *Vanessa Cardoso, 2012-12-31*

A study of multi-functional carbon nanofiber-based polymer nanocomposites *Paleo Vieito, 2012-12-31*

Magnetolectric nanostructures

Jose Manuel Gusman Correia Araújo Barbosa, (on-going)

Manganite thin films deposited on piezoelectric substrates  
*Isabel Alexandra Domingues Tarroso Gomes, (on-going)*

A study on the electrical properties of carbon nanofibre polymer composites  
*Paulo Jorge Magalhaes Cardoso, (on-going)*

Desenho nanocompositos poliméricos electroactivos com materiais porosos estruturados  
*Ana Catarina Teixeira Castro Lopes, (on-going)*

Study and optimization of the macroscopic response of carbon based nanocomposites for advanced applications  
Jaime Pedro Oliveira da Silva, (on-going)

Materiais inteligentes electroactivos para aplicações têxteis e biomédicas  
*Vitor Correia, (on-going)*

Modelação, simulação e implementação do fenómeno de "acoustic streaming" produzido por polímeros piezoelétricos para microbombeamento e microagitação em micro dispositivos para análises de fluidos  
*Susana Oliveira Catarino, (on-going)*

Nanocomposites for electrostatic energy storage systems  
*Joao Pedro Nunes Pereira, (on-going)*

Electroactive polymer based porous membranes for energy storage applications  
*Carlos Miguel da Silva Costa, (on-going)*

Development of a pressure sensor network system for static and dynamic pressure measurements. Application to the limb/prosthesis pressure mapping  
Armando Jose Barros Ferreira, (on-going)

Understanding the mechano-electrical behaviour of nanostructured conductive thermoplastic elastomers, *Pedro Costa, (on-going)*

Desenvolvimento de etiquetas RFID passivas e chipless para aplicação em produtos têxteis lar *Helder Castro, (on-going)*

Modeling of the electrospinning process for the obtention of polymer micro and Nanofibers *Jieci-Wang , (on-going)*

Development of magnetoelectric polymer based aminated composites *Claudia Sofia Lehman Fernandez, (on-going)*

Development of multifunctional coatings deposited on polymer substrates *Mariana Marques, (on-going)*

Polymer based batteries fabricated by printing technologies *Ricardo Jorge E. M. Goncalves Sousa, (on-going)*

### **2.2.7 Group Summary**

	number
Articles in international journals	51
International Conference Proceedings	3
Oral presentations in international conferences	13
Poster presentations in international conferences	20
Presentations in national conferences	6
PhD Theses	5

## 2.3 Physics of Nanocrystalline Materials Group

### 2.3.1 Objectives

Studies of the electrical and optical properties of doped ZnO in the bulk and thin film forms.  
Development of BST based graded structures. In-depth characterization of the recently identified layer at the interface Pt-BST.

Raman study of the evolution of ceramic pigments encapsulated in a glassy phase versus heat treatment conditions.

Raman study of the pigments present in ancient French enamels.

Development of the recently installed modulated IR radiometry setup, to explore new effects, e.g. surface roughness, and the possibility to "in situ" control deposition process.

### 2.3.2 Achievements

- Fabrication of multi-layer SiGe NCs/SiO<sub>2</sub> structures by RF magnetron sputtering and study of their structural, electrical and optical properties;
- Incorporation of Ge nanoparticle layers into metal-oxide-semiconductor (MOS) structures (Al<sub>2</sub>O<sub>3</sub>, HfAlO);
- Establishing the relationship between microstructure and dielectric/ ferroelectric properties of thin films of Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiO<sub>3</sub> (BST) grown by pulsed laser deposition;
- Characterization of donor defects induced in thin films of Zn<sub>1-x</sub>CoxO;
- Growth of MOS structures including layers of amorphous Si<sub>1-x</sub>Ge<sub>x</sub> (a-SiGe) in a SiO<sub>2</sub> matrix;
- Identification of the electrode texture effect as a mechanism of induced electrical conductivity;
- Dielectric / ferroelectric properties related to the tetragonal structure and the orientation of Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiO<sub>3</sub> films;
- Preparation, by the sol-gel technique, of highly transparent monoliths with diffraction grating labeled surface.

### 2.3.3 Team

Group coordinator: Mário António Caixeiro de Castro Pereira

Group	Física de Materiais Nanocristalinos / Physics of Nanocrystalline Materials
Coordinator	Mário A. C. Castro Pereira
Research area	Nanotechnology and nano-materials physics
Institution	Centro de Física da Universidade do Minho (CFUM)
Members	<p><b>Effective members:</b></p> <p>Anatoli Khodorov – Researcher (Ciência 2007) António Mário Almeida – Assistant Professor M. Jesus M. Gomes – Full Professor Mário A. C. Castro Pereira – Assistant Professor</p> <p><b>Collaborators:</b></p> <p><i>Investigators with Phd:</i> Sergej Levichev – Post-Doc (FCT) Koppople Sekhar – Post-Doc (FCT, since December 2010) Adil Chahboun – Chahboun (external collaborator with PhD)</p> <p><i>Phd and other student:</i> Sofia Alexandra de Sousa Rodrigues - PhD student (FCT) Eliana Maria Fernandes Vieira - PhD student (FCT) José Pedro Basto da Silva - PhD student (FCT) Sandra D.F.C. Moreira (com DQ-ECUM)- PhD student (FCT) Luis Fernandes Gonçalves (com DQ-ECUM)- PhD student (FCT) Ouiame Karzazi – PhD student</p>

## 2.3.4 Publications

### Articles in international journals

Carrier storage in Ge nanoparticles produced by pulsed laser deposition

J. Martín-Sánchez, A. Chahboun, M. J. M. Gomes, A. G. Rolo, B. Pivac, and I. Capan Phys. Status Solidi RRL, 1-3 (2012) / DOI 10.1002/pssr.201206104 : () 000303760000019. (Collaboration with GCEP)

Development of new high transparent hybrid organic-inorganic monoliths with surface engraved diffraction pattern.

Moreira, S., Silva, C. J. R., Prado, L., Costa, M. F. M., Boev, V. I., Martín-Sánchez, J., & Gomes, M. J. M.

Journal of Polymer Science Part B-Polymer Physics, 50(7), 492-499 (2012). : () 000300702700005 (Collaboration with OCV)

*Effect of oxygen pressure on the structural and magnetic properties of thin Zn<sub>0.98</sub>Mn<sub>0.02</sub>O films* Khodorov, A.G. Rolo, E.K. Hlil, J. Ayres de Campos, O. Karzazi, S. Levichev, M.R. Correia, A. Chahboun and M.J.M. Gomes

Eur. Phys. J. Appl. Phys., 57 , 10301 (2012) : () 000298226800006 (Collaboration with FAMO, GCEP)

Enhanced ferromagnetism and glassy state in phase separated La<sub>0.95</sub>Sr<sub>0.05</sub>MnO<sub>3+d</sub>

K. De, S. Das, A. Roy, P. Dhak, M. Willinger, J. S. Amaral, V. S. Amaral, S. Giri, S. Majumder, C. J. R. Silva, M. J. M. Gomes, and P. K. Mahapatra

JOURNAL OF APPLIED PHYSICS 112, 103907 (2012) (Impact Factor: 2.168), : () 000311969800082

Ferroelectric switching behavior of pulsed laser deposited Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiC<sub>3</sub> thin films J. P. B. Silva, K. C. Sekhar, S.A. S. Rodrigues, A. Khodorov, J. Martín-Sánchez, Múario Pereira, M. J. M. Gomes

Current Applied Physics 12(4), 1144-1147 (2012) (Impact factor=1.90) : () 000303129800025

Ge nanocrystals with highly uniform size distribution deposited on alumina at room temperature by pulsed laser deposition: structural, morphological, and charge trapping properties

J. Martín-Sánchez, L. Marques, E. M. F. Vieira, Q. T. Doan, A. Marchand, A. El Hdiy, A. G. Rolo, S. R. C. Pinto, M. M. D. Ramos, A. Chahboun M. J. M. Gomes J Nanopart Res (2012) 14:843 : () 000304155900009 (Collaboration with GCEP, FCT)

Influence of annealing conditions on the formation of regular lattices of voids and Ge quantum dots in an amorphous alumina matrix,

S R C Pinto, M Buljan, L Marques, J Martín-Sánchez, O Conde, A Chahboun, A R Ramos, N P Barradas, E Alves, S Bernstorff, J Grenzer, A Mucklich, M M D Ramos and M J M Gomes, Nanotechnology 23 (2012) 405605 (9pp), 2012 : () 000309506500012 (Collaboration with FCT)

*Oxygen partial pressure effect on electrical behavior of pulsed laser deposited Zn<sub>0.98</sub>Co<sub>0.02</sub>O thin films*, K.C.Sekhar, A. Khodorov, A. Chahboun, S Levichev, A. Almeida, J.

Agostinho Moreira, C. J. R. Silva, M. Pereira and M. J. M. Gomes, Structural and Electrical Properties of Nanostructured Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiO<sub>3</sub> Films Deposited by Pulsed Laser Deposition Mater. Chem. Phys., Vol. 135, pp. 174-180 (2012) : () 000306034500027

Structural and Electrical Properties of Nanostructured Ba<sub>0.8</sub>Sr<sub>0.2</sub>TiO<sub>3</sub> Films Deposited by Pulsed Laser Deposition

J. P. B. Silva, S.A.S. Rodrigues, A. Khodorov, J. Martín-Sánchez, M. Pereira, E. Alves, M. J. M. Gomes, Ph. Colombari, Journal of NanoResearch, vol.18-19, 299-306 (2012). : () 000309295700032

Structural and electrical studies of ultrathin layers with Si<sub>0.7</sub>Ge<sub>0.3</sub> nanocrystals confined in a SiGe/SiO<sub>2</sub> superlattice,

E. M. F. Vieira, J. Martín-Sánchez, A. G. Rolo, A. Parisini, M. Buljan, I. Capan, E. Alves, N. P. Barradas, O. Conde, S. Bernstorff, A. Chahboun, S. Levichev, M. J. M. Gomes. Journal of Applied Physics, Vol.111, Issue 10 : () 000305363700149 (Collaboration with GCEP)

Structural Study of Formation of Mn-Doped ZnO Nanocrystals Embedded in Alumina Matrix from ZnMnO/Al<sub>2</sub>O<sub>3</sub> Multilayer Nanostructures

Levichev, S (Levichev, Sergey); Khodorov, A (Khodorov, Anatoli); Karzazi, O (Karzazi, Ouiame); Vorobiev, A (Vorobiev, Alexei); Chahboun, A (Chahboun, Adil); Konovalov, O (Konovalov, Oleg); Gomes, MDM (Matos Gomes, Maria de Applied Physics Express 5 (4) (2012) : () 000303931500001

Tuning the properties of Ge-cluster lattices in amorphous silica matrix through deposition conditions

S R C Pinto, M Buljan, A Chahboun, M A Roldan, S Bernstorff, M Varela, S J Pennycook, N P Barradas, E Alves, S I Molina, M M D Ramos, M J M Gomes  
Journal of Applied Physics, 111, 074316 (2012); doi: 10.1063/1.3702776, : () E000303282402139 (Collaboration with FCT)

## 2.3.5 Academic Training

### PhD Theses

- Estudo de filmes finos ferroelétricos de PZT com estrutura em multicamada para aplicações tecnológicas *Sofia Alexandra de Sousa Rodrigues, 2012-12-31*
- Funcionalização de materiais híbridos com nanopartículas de metais e de semicondutores *Luís Filipe Fernandes Ferreira Goncalves, 2012-10-31*
- Crescimento e caracterização de estruturas tipo memórias voláteis à base de nanocristais de semicondutores inseridos em camadas dielétricas de k elevado, *Eliana Maria Fernandes Vieira, (on-going)*
- Organic-inorganic composites with tailored optical properties by doping hybrid matrix with metal nanoparticles, *Sandra Daniela Freitas da Costa Moreira, (on-going)*
- Growth and characterization of structural, optical, and magnetic properties of doped ZnO nanocrystals embedded in high-k dielectrics, *Ouiame Karzazi, (on-going)*
- Growth and study of layered ferroelectric thin film materials based structures of (BST) layers *Jose Pedro Basto da Silva, (on-going)*

### 2.3.6 Group Summary

	number
Articles in international journals	13
PhD Theses	2

## 2.4 Complexity and Electronic Properties Group

### 2.4.1 Objectives

#### 1. Theoretical Physics

- Study of the frequency-dependent conductivity of several forms of graphene; Study of BN single and bi-layers and its interactions with graphene.
- Application of methods of Complex Analysis to resolution of inverse optical problems and the study of the Gross-Pitaevski equation;
- Study of superpositions of linear (Schrodinger cat-like) solutions of the non-linear Schrodinger equation and analysis of the conditions for its existence and stability.
- Investigation of the graphene polaritonic crystal eigenmode, and of light propagation and excitation of plasmons in such a structure.
- Studies of electromagnetic interactions in a system of very small polarizable particles (metallic nanoparticles and semiconductor quantum dots)..

#### 2. Experimental Physics

- On the "atom chip" experiment, we expect to complete the assemblage of the Magneto-Optical Trap and to include the atom chip in the setup.
- On photothermal measurements, we will further develop the recently installed modulated IR radiometry setup, to explore new effects, e.g. IR semi-transparency, surface roughness, and the possibility to "in situ" control deposition process.

#### 3. Applied Physics

- Solar cells: fabrication of flexible thin-film Si solar cells; encapsulation of organic solar cells; development of CIS/a-Si heterojunction solar cell; monitoring of annual energy yield of photovoltaic systems.
- Sensors: study of piezoresistive properties of doped nanocrystalline Si and development of strain sensor arrays for health care applications.

### 2.4.2 Achievements

- Study of plasmonic effects in graphene and applications of plasmon-polaritons in graphene nanostructures;
- Study of electronic transport through one-dimensional defects in graphene;
- Collective effects in the absorption and emission of light in assemblies of plasmonic nanoparticles and semiconductor quantum dots;
- Crystallization and dopant activation of very thin films of Si (10-50 nm) by laser irradiation;
- Development of multilayer thin films of silicon nitride by HW-CVD; their tests as barriers for the diffusion of oxygen and moistening in encapsulation systems for organic solar cells (PICS Project with LPICM, France);
- Fabrication of micro- and nano-devices based on graphene using UV optical lithography and electron beam lithography;
- Manufacturing of field effect transistors and Hall effect devices; study of the effect of contact metal used for electrostatic doping of graphene;
- Study of surface effects in modulation photothermal radiometry measurements applied to thin films deposited on different substrates;
- Fabrication of nanoporous alumina templates for applications in the manufacture of solar cells and substrates for cell culture.

### 2.4.3 Team

**Group Coordinator:** José Manuel Pereira Carmelo/Francisco José Machado de Macedo

Grou	Grupo de Complejidades e Propriedades Electrónicas /Complexity and Electronic Properties
Coordinator	José Manuel Pereira Carmelo/Francisco José Machado de Macedo
Research area	Nanomaterials, Condensed matter physics
Institution	Centro de Física

Members	<p><b>Effective members</b></p> <p>Anabela G Rolo – – Assistant Professor  Anura P Samantilleke - Researcher (Ciência 2007)  Francisco J M Macedo – – Assistant Professor  Gueorgui V Smirnov– Full Professor  Jaime E V S M Santos - Researcher (Ciência 2008)  João Pedro H A Alpuim – – Assistant Professor  José M P Carmelo – Professor Catedrático  José Carlos V Gomes – – Assistant Professor  Maria Fátima G Cerqueira – – Assistant Professor  Maria José F A F Sampaio – – Assistant Professor  Mikhail I Vasilevskiy– Full Professor  Nuno M R Peres– Professor Catedrático  Ricardo P L M M Ribeiro – – Assistant Professor  Vadim Ponomarenko - Researcher (Ciência 2007)  Yuliy Bludov - Researcher (Ciência 2008)</p> <p><b>Associate members</b></p> <p>Norberto Gonçalves - Assistant Professor (UTAD)  Ivan Larkin- Lead Researcher (Welcome II)</p> <p><b>Collaborators:</b></p> <p>Investigators with PhD:  Aires Ferreira, Post-Doc, SNU</p> <p>Phd and ther student:  Filipe Oliveira - PhD student (FCT)  Emilio Vieira Pinto - PhD student (FCT)  Flavio Portas Pinheiro - PhD student FCT  Yuriel Nuñez Fernández - PhD student (BI)  Gustavo Miranda - (BI)</p>
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### 3.4.4 Publications

#### Articles in international journals

Carrier storage in Ge nanoparticles produced by pulsed laser deposition  
J. Martín-Sánchez, A. Chahboun, M. J. M. Gomes, A. G. Rolo, B. Pivac, and I. Capan  
Phys. Status Solidi RRL, 1-3 (2012) / DOI 10.1002/pssr.201206104 : ()  
00030376000019. (Collaboration with FMNC).

Charge dynamics in half-filled Hubbard chains with finite on-site  
interaction, *Pereira, R. G.; Penc, K.; White, S. R.; et al.*, Phys Rev B  
85, 16. 165132, (2012) : () 000303068800003

*Confined Magneto-Optical Waves in Graphene*, Aires Ferreira, N. M. R. Peres e A.  
H. Castro Neto, Physical Review B 85, 205426 (2012). : () 000304081900013

Continuum Model of the Twisted Bilayer, J. M. B. Lopes dos  
Santos, N. M. . Peres e A. H. Castro Neto, Physical Review B 86,  
155449 (2012). : () 000310195900007

Effect of hot-filament annealing in a hydrogen atmosphere on the electrical and  
structural properties of Nb-doped TiO<sub>2</sub> sputtered thin films, C.J. Tavares, M.V. Castro,  
E.S. Marins, A.P. Samantilleke, S. Ferdov, L. Rebouta, M. Benelmekki, M.F. Cerqueira, P.  
Alpuim, E. Xuriguera, J.-P. Riviere, D. Eyidi, M.-F. Beaufort, A. Mendes, Thin Solid Films  
520, 2514-2519, 2012. : () 000301085100022 (Collaboration with GRF)

*Effect of oxygen pressure on the structural and magnetic properties of thin  
Zn<sub>0.98</sub>Mn<sub>0.02</sub>O films*  
Khodorov, A.G. Rolo, E.K. Hlil, J. Ayres de Campos, O. Karzazi, S. Levichev, M.R. Correia, A.  
Chahboun and M.J.M. Gomes, Eur. Phys. J. Appl. Phys., 57 , 10301 (2012) : ()  
000298226800006 (Collaboration with FAMO, FMNC)

Electron Tunneling through Ultrathin Boron Nitride Crystalline Barriers,  
Liam Britnell, Roman V. Gorbachev, Rashid Jalil, Branson D. Belle, Fred Schedin, Mikhail I.  
Katsnelson, Laurence Eaves, Sergey V. Morozov, Alexander S. Mayorov, N. M. R. Peres,  
Antonio H. Castro, Neto, Jon Leist, Andre K. G, Nano Letters 12, 1707 (2012). : ()  
000301406800102

Enhanced Optical Dichroism of Graphene Nanoribbons,, F. Hipolito, A. J. Chaves, R. M.  
Ribeiro, M. I. Vasilevskiy, Vitor M. Pereira, e N. M. R. Peres, Physical Review B 86, 115430  
(2012). : () 000308866700007

FEM numerical analysis of excimer laser induced modification in alternating multi-layers  
of amorphous and nano-crystalline silicon films, J.C. Conde, E. Martin, S. Stefanov, P.  
Alpuim, S. Chiussi,  
Applied Surface Science, 258, 9342 (2012). : () 000307241800049

Field-Effect Tunneling Transistor Based on Vertical Graphene Heterostructures,

L. Britnell, R. V. Gorbachev, R. Jalil, B. D. Belle, F. Schedin, A. Mishchenko, T. Georgiou, M. I. Katsnelson, L. Eaves, S. V. Morozov, N. M. R. Peres, J. Leist, A. K. Geim, K. S. Novoselov e L. A. Ponomarenko, *Science*, 335, 947 (2012). : () 000300931800040

Ge nanocrystals with highly uniform size distribution deposited on alumina at room temperature by pulsed laser deposition: structural, morphological, and charge trapping properties, J. Martín-Sánchez, L. Marques, E. M. F. Vieira, Q. T. Doan, A. Marchand, A. El Hdiy, A. G. Rolo, S. R. C. Pinto, M. M. D. Ramos, A. Chahboun M. J. M. Gomes *J Nanopart Res* (2012) 14:843 : () 000304155900009 (Collaboration with FMNC, FCT)

Graphene-based photodetector with two cavities, Aires Ferreira, N. M. R. Peres, R. M. Ribeiro e T. Stauber, *Physical Review B* 85, 115438 (2012). : () 000301916100008

Graphene-based polaritonic crystal, Yu. V. Bludov, N. M. R. Peres e M. I. Vasilevskiy, *Physical Review B* 85, 245409 (2012). : () 000301916100008

Hubbard-model description of the high-energy spin-weight distribution in  $\text{La}_2\text{CuO}_4$ , Carmelo, J. M. P.; Araujo, M. A. N.; White, S. R.; et al., *Phys Rev B* 86, 6, 064520, (2012) : () 000307719400007

Light emission and spin-polarised hole injection in InAs/GaAs quantum dot heterostructures with Schottky contact, N. V. Baidus, M. I. Vasilevskiy, S. V. Khazanova, B. N. Zvonkov, H. P. van der Meulen, J. M. Calleja, and L. Vina, *Europhysics Letters* 98, 27012 (6 pages), (2012). : () 000303754100027

Light scattering by a medium with a spatially modulated optical conductivity: the case of graphene, N. M. R. Peres, Aires Ferreira, Yu. V. Bludov e M. I. Vasilevskiy, *Journal of Physics: Condensed Matter* 24, 245303 (2012). : () 000304874900017

Numerical investigation of effects of buoyancy around a heated circular cylinder in parallel and contra flow, Armando A. Soares, N. D. C., M. Duarte Naia, Norberto J. Goncalves, Abel Rouboa, *Journal of Mechanical Science and Technology*, 26, 1501-1513, (2012) : () 000303841900025

On Coulomb drag in double layer systems, Bruno Amorim e N. M. R. Peres, *Journal of Physics: Condensed Matter* 24, 335602 (2012). : () 000306997300012

On the Newton method for set-valued maps, S. Dias, G. Smirnov, *Nonlinear Analysis: Theory Methods and Applications* 75, 1219-1230, (2012) : () 000296865700017

On the optimal control of a cascade of hydro-electric power stations, A.F. Ribeiro, M.C. Guedes, G. Smirnov, S. Vilela, *Electric Power Systems Research*, 88, 121-129, (2012) : () 000303956000014

*Production and PFM Characterization of Barium Titanate Nanofibers*, P. Sa, I. Bdikin, B. Almeida, A.G. Rolo, and D. Isakov, *Ferroelectrics*, 429:1 48-55, (2012). : () 000305953800008 (Collaboration with FCD)

p-Type behaviour of electrodeposited ZnO:Cu films, Bernabe Marí, Mustapha Sahal, Miguel A. Mollar, Fatima M. Cerqueira and Anura P. Samantilleke, *Journal of Solid State Electrochemistry* 16, 6, 2261-2265 (2012) : () 000304456200031

Resonant Excitation of Confined Excitons in Nanocrystal Quantum Dots Using Surface Plasmon- Polaritons, Yu. V. Bludov and M. I. Vasilevskiy, *J. Phys. Chem. C* 116, p. 13738-44, (2012). : () 000305769900033

*Scattering by linear defects in graphene: a continuum approach*, J. N. B. Rodrigues, N. M. R. Peres e J. M. B. Lopes dos Santos, *Physical Review B* 86, 214206 (2012). : () 000312290600001

Segregation of Te at the back contact in electrochemically deposited CdTe thin film solar cells, A.P. Samantilleke, M.F.Cerqueira, B.Mari, *Journal of Crystal Growth* 320, 13-17 (2012) : () 000289325800004

Simple way to make Anatase TiO<sub>2</sub> films on FTO glass for promising solar cells, T. Raghavender, A. P. Samantilleke, Pedro Sa, B. G. Almeida, M. I. Vasilevskiy, and Nguyen Hoa Hong, *Materials Letters* 69, p. 59-62, (2012). : () 000300190300018 (Collaboration with FCD)

Spin-spectral-weight distribution and energy range of the parent compound La<sub>2</sub>CuO<sub>4</sub>. Araujo, M. A. N.; Carmelo, J. M. P.; Sampaio, M. J.; et al., *EPL* 98, 6, 67004, (2012) : () 000306425000023

Structural and electrical studies of ultrathin layers with Si<sub>0.7</sub>Ge<sub>0.3</sub> nanocrystals confined in a SiGe/SiO<sub>2</sub> superlattice, E. M. F. Vieira, J. Martín-Sánchez, A. G. Rolo, A. Parisini, M. Buljan, I. Capan, E. Alves, N. P. Barradas, O. Conde, S. Bernstorff, A. Chahboun, S. Levichev, M. J. M. Gomes. *Journal of Applied Physics*, Vol.111, Issue 10 : () 000305363700149 (Collaboration with FMNC)

Superfluidity of Bose-Einstein condensates in toroidal traps with nonlinear lattices, V. Yulin, Yu. V. Bludov, V. V. Konotop, V. Kuzmiak, M. Salerno, *Phys. Rev. A* 84, 063638, 2011. : () 000298564400011

The SO(3) x SO(3) x U(1) Hubbard model on a square lattice in terms of c and alpha nu fermions and deconfined eta-spinons and spinons, Carmelo, J. M. P., *Annals of Physics*, 327, 3, (pp 553-638), (2012) : () 000300756300001

TiO<sub>2</sub> coatings with Au nanoparticles analysed by photothermal IR radiometry, Macedo, F; Vaz, F; Torrel, M; Faria, RT; Cavaleiro, A; Barradas, NP; Alves, E; Junge, KH; Bein, BK, *J. Phys. D - Appl. Phys.*, 45 105301 (8 pp) (2012). : () 000301055500005 (Collaboration with GRF)

Tunable graphene-based polarizer, Yu. V. Bludov, M. I. Vasilevskiy e N. M. R. Peres, *Journal of Applied Physics* 112, 084320 (2012). : () 000310597500120

## 2.4.5 Presentations

### Oral presentations in international conferences

Thin Film Solar Cells, presented by Anura Priyajith Samantilleke, 2nd International Conference on Green Technologies, — Haridwar, India, .

Ophthalmic dispensing in children, presented by Antonio Manuel Gonçalves Baptista International Summer Orbital manoeuvres with single-input control, Gueorgui Smirnov, Anna Guerman, 1st IAA Conference on Dynamics and Control of Space Systems, DyCoSS'2012, — Porto, .

Mechanism of optoelectronic switch, operating on surface plasmon-polaritons in monolayer grapheme, *presented by Yuliy Bludov*, 3rd International Conference on Metamaterials, Photonic Crystals and Plasmonics (META2012), — Paris, France, .

On the complexity of the set-valued Newton method, *presented by Gueorgui Vitalievitch Smirnov* 3rd Optimization Methods and Software Conference, — Chania, Crete, Greece, .

*On the optical properties of graphene and their applications*, presented by Nuno Miguel Machado Reis Peres IX Meeting of CICECO, — Aveiro, Portugal, .

Evidence of self-organized Si<sub>1-x</sub>Ge<sub>x</sub> nanoparticles in Al<sub>2</sub>O<sub>3</sub> multilayer structure , *presented by Eliana Maria Fernandes Vieira*, E-MRS 2012 SPRING MEETING, Symposium L - Novel Functional Materials and Nanostructures for innovative non-volatile memory devices, — Congress Center - Strasbourg, France, .

Thin film devices fabricated on flexible substrates, INL-MIT Workshop on Nanostructured Materials, Devices, and Systems, MIT, — Cambridge, MA, Stata Center Classroom 32-141..

Spin-spectral weight distribution and energy range of the parent compound La<sub>2</sub>CuO<sub>4</sub>, *presented by Jose Carmelo*, Nature Conference Frontiers in Electronic Materials: Correlation Effects and Memristive Phenomena , Eurogress Aachen, — Aachen, Germany, .

Localized Surface Plasmon-Effect on Dye-Sensitized Solar Cells using Au nanoparticle incorporated photoanode. presented by Anura Priyajith Samantilleke, EMR 2012 : The Energy and Materials Research Conference. — Malaga, Spain, .

Properties of ZnO/Hybrid Thin Films Deposited by Cathodic Electrodeposition. *presented by Anura Priyajith Samantilleke*, A.P. EMR 2012 : The Energy and Materials Research Conference. — Malaga, Spain, .

*On the optical properties of graphene and their applications*, presented by Nuno Miguel Machado Reis Peres Carbonhagen, — Copenhagen, Dinamarca, .

Surface plasmon-polaritons in multilayer nanostructures , *presented by Mikhail Vasilevskiy* Summer School on Recent Advances in Optics and Photonics, — FCUP, Porto, Portugal, .

Electrochemically Anodised Alumina Templates, *presented by Anura Priyajith Samantilleke* 6th International Conference on Developments in Materials, Processes and applications of Emerging Technologies (MPA)- — Algarve Portugal..

Surface polaritons in grapheme, *presented by Yuliy Bludov*, 14th International Conference on Mathematical Methods in Electromagnetic Theory (MMET2012), — Kharkov, Ukraine, .

Phonon modes and Raman scattering in SixGe<sub>1-x</sub> nanocrystals: microscopic modelling, *presented by Mikhail Vasilevskiy*, E- MRS 2012 Fall Meeting - — Warsaw, Poland, .

Structural and optical studies of ordered self-assembled Ge quantum dots lattices embedded in amorphous Al<sub>2</sub>O<sub>3</sub> matrix, presented by Anabela Gomes Rolo, E-MRS 2012 FALL MEETING, Symposium E - Nanoscaled Si, Ge based materials: Fabrication, characterization, devices, — Warsaw University of Technology, Poland, .

Surface plasmon-polaritons in structures with monolayer graphene, *presented by Yuliy Bludov*

EOS Annual Meeting 2012, Proceedings Tom 3 (ISBN 978-3-9815022-4-4). — Aberdeen, Scotland, UK, .

Effect of Argon plasma treatment on the permeation barrier performance of silicon-nitride thin film, *presented by Maria de Fatima Guimaraes Cerqueira*, 7Th International Conference on Hot-Wire Chemical Vapor Deposition (cat-CVD), HWCVD7, — Osaka, Japan, .

Plasmonic effects in graphene, *presented by Yuliy Bludov*

Workshop Nano12 - Shaping the Future, — Lisbon, Portugal, .

### **Poster presentations in international conferences**

Multilayers of Silicon nitride thin films as an encapsulation barrier for flexible organic electronic devices, *presented by Maria de Fatima Guimaraes Cerqueira*  
DIELOR 2012 — conference at Limoges, France, .

*Encapsulation for organic devices deposited on polymer substrates*, presented by Maria de Fatima Guimaraes Cerqueira IONS2012 - — Paris, .

Surface polaritons at the interface between a metal and a layer of nanocrystal quantum dots, *presented by Yuliy Bludov*, 3rd International Conference on Metamaterials, Photonic Crystals and Plasmonics (META2012), — Paris, France, .

*Raman study of Mn-doped ZnO thin films*, presented by Maria de Fatima Guimaraes Cerqueira

E-MRS 2012 Spring Meeting - — Strasbourg, France,

Silicon nitride multilayers as permeation barrier for OLEDs on flexible PET substrates. Effect of Ar plasma treatment, presented by Maria de Fatima Guimaraes Cerqueira E-MRS 2012 Spring Meeting - — Strasbourg, France, .

*Raman study of Mn-doped ZnO thin films*, presented by Maria de Fatima Guimaraes Cerqueira

E-MRS 2012 SPRING MEETING, Symposium Q - Novel materials and fabrication methods for new emerging device, — Congress Center - Strasbourg, France, .

SiGe and Ge nanocrystals embedded in dielectrics for carrier retention applications, *presented by Eliana Maria Fernandes Vieira*, E-MRS 2012 SPRING MEETING, Symposium L - Novel Functional Materials and Nanostructures for innovative non-volatile memory devices, — Congress Center - Strasbourg, France, .

Synthesis, structural characterization and ferroelectric properties of the barium titanate nanofibers, *presented by Dmitry Isakov*, E-MRS 2012 SPRING MEETING, Symposium Q - Novel materials and fabrication methods for new emerging device, — Congress Center - Strasbourg, France, .

Study of the oxidation process of Ti thin films using modulated infrared radiometry, *presented by Francisco Jose Machado de Macedo*, 13th International conference on plasma surface engineering (PSE), — Garmisch-Partenkirchen, .

Effect of Mn and Al doping on the Faraday rotation in ZnO thin films, *presented by Maria de Fatima Guimaraes Cerqueira*, E- MRS 2012 Fall Meeting - — Warsaw, Poland, .

Memory characteristics of layered SiGe nanoparticles embedded in SiO<sub>2</sub>, *presented by Eliana Maria Fernandes Vieira*, E-MRS 2012 FALL MEETING, Symposium E - Nanoscaled Si, Ge based materials: Fabrication, characterization, devices, — Warsaw University of Technology, Poland,

Resonant coupling between surface polaritons and QD excitons in metal-QD heterostructures, *presented by Yuliy Bludov*, EOS Annual Meeting 2012, Proceedings Tom 3 (ISBN 978-3-9815022-4-4). — Aberdeen, Scotland, UK, .

Direct laser writing on very thin amorphous silicon films of highly conductive doped nanocrystalline silicon structures, *presented by Maria de Fatima Guimaraes Cerqueira*, 9th Symposium Confocal Raman imaging WITec - — Ulm, Alemanha, .

Bunching of fractional electron charges in counting statistics of edge-state Mach-Zehnder interferometer, *presented by Vadim Ponomarenko*

Ballistic Vest, Francisco Soares,, *presented by Francisco Jose Machado de Macedo*, 9th International Conference on Hands on Science, — Antalya, Turquia, .

## **Presentations in national conferences**

Self- assembly of Ge quantum dots in alumina matrix and formation of voids after thermal treatments *presented by Sara Raquel da Costa Pinto*, 1<sup>o</sup> ENURS / 1st. MSRUP- 1<sup>o</sup> Encontro Nacional de Utilizadores de Radiação de Sincrotrão, CENIMAT, FCT/UNL — Campus da Caparica, Portugal.

Counting statistics of fractional charges transferred through interacting electron systems *presented by Vadim Ponomarenko*, Jornadas do Centro de Física da Universidade do Minho — Braga, Portugal.

Electronic Doping of Graphene by deposited transition metal atoms, Jornadas de Física da Universidade do Minho — Braga, Portugal.

*Graphene plasmonics*, *presented by Yuliy Bludov*, Jornadas do Centro de Física de Universidade do Minho — Braga, Portugal.

Quantum Dot Solar Cells, Nuno Ferreira *presented by Anabela Gomes Rolo*, Jornadas do Centro de Física de 2012 — Anfiteatro da Escola de Ciências da Universidade do Minho.

## **2.4.6 Academic Training**

### **PhD Theses**

Preparação e caracterização de filmes finos termocromáticos à base de VO<sub>2</sub> para aplicação em janelas inteligentes com control active do espectro solar, Carlos Emanuel Peixoto Batista, (on-going)

Crescimento e caracterização de estruturas tipo memórias volateis à base de nanocristais de semicondutores inseridos em camadas dieléctricas de k elevado, Eliana Maria Fernandes Vieira, (on-going)

Photonic integrated circuit (PIC) devices for inter-chip optical communication using GsSn alloy layers grown on Silicon substrates, Filipe Andre Peixoto Oliveira, (on-going)

Bose-Einstein condensate of exciton-polaritons in semiconductor microcavity *Yuriel Nuñez Fernandez, (on-going)*

Caracterização de processos de auto-organização em redes complexas adaptativas *Flávio Luís Portas Pinheiro, (on-going)*

Tailoring the opto-electronic properties of grapheme by mechanical deformations *Bruno Amorim, (on-going)*

#### **2.4.7 Group Summary**

	number
Articles in international journals	33
Oral presentations in international conferences	19
Poster presentations in international conferences	15
Presentations in national conferences	5

## 2.5 Computational and Theoretical Physics Group

### 2.5.1 Objectives

Computational and spectroscopic study of the plasma plume during Laser Ablation of Si, Ge, ZnO and magnetron sputtering of AlNO.

Computational study of N<sub>2</sub>-H<sub>2</sub> radio frequency discharges.

Computational study of the effect of the spatial distribution of inorganic salt doping on polymer LEDs, photo-diodes and photovoltaic cells.

Investigate the mechanisms of formation of pure bile micelles.

Investigate the dynamics of water near disaccharides and at the air-water interface.

### 2.5.2 Achievements

Investigation of air-water interface and adsorption of homopolypeptides on gold surfaces by molecular dynamics;

Development of a multi-scale model to investigate the functioning of organic solar cells;

Development of a multi-scale model to investigate the mechanical and electrical properties of polymer/carbon nanotube composites;

Simulation of radio frequency discharges for On Lab study of solar planet atmospheres;

Modeling of optical and electric properties of AlNyOx thin films.

### 2.5.3 Team

Team coordinator: Marta Ramos

Group	Grupo de Física Computacional e Teórica/Computational and Theoretical Physics
Coordinator	Marta Ramos
Research area	Plasma Physics, Physics of the condensed matter
Institution	Universidade do Minho

Members	<p><b>Effective members</b></p> <p>Luis Silvino Alves– Assistant Professor  Marta Maria Ramos Duarte– Associate Professor with Aggregation</p> <p><b>Collaborators</b></p> <p><i>Investigators with PhD</i></p> <p>Helena Correia– FCT Post-Doc grant  Hélder Barbosa– FCT Post-Doc grant  Sara Pinto - FCT Post-Doc grant  Ana Célia Vilaverde</p> <p>Phd and other student:</p> <p>Joel Nuno Pinto Borges – Phd Student  Sergey Pyrlin – Phd Student  Vitor Vasconcelos - Phd Student</p>
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## 2.5.4 Publications

### Articles in international journals

Capacitively coupled radio-frequency discharges in nitrogen at low pressures,  
L. L. Alves, L. Marques, C. D. Pintassilgo, G. Wattieaux, E. T. Es-Sebbar, J. Berndt, E. Kovacevic,  
N. Carrasco, L. Boufendi, G. Cernogora,  
Plasma Sources Sci. Technol. 21, 045008 (19pp), 2012 : ( ) 000307307600011

Electrical Properties of Al<sub>N</sub>O<sub>y</sub> Thin Films Prepared by Reactive Magnetron Sputtering,  
J. Borges, N. Martin, N.P. Barradas, E. Alves, D. Eyidi, M.F. Beaufort, J.P. Riviere, F. Vaz,  
L.Marques, Thin Solid Films 520, 6709-6717, 2012. : ( ) 000307286100048 (Collaboration with  
GRF)

Ge nanocrystals with highly uniform size distribution deposited on alumina at room  
temperature by pulsed laser deposition: structural, morphological, and charge trapping  
properties  
J. Martín-Sanchez, L. Marques, E. M. F. Vieira, Q. T. Doan, A. Marchand, A. El Hdiy, A. G. Rolo,  
S. R. C. Pinto, M. M. D. Ramos, A. Chahboun M. J. M. Gomes J Nanopart Res (2012) 14:843 : ( )  
000304155900009 (Collaboration with FMNC, GCEP)

Influence of annealing conditions on the formation of regular lattices of voids and Ge  
quantum dots in an amorphous alumina matrix,  
S R C Pinto, M Buljan, L Marques, J Martín-Sanchez, O Conde, A Chahboun, A R Ramos, N P  
Barradas, E Alves, S Bernstorff, J Grenzer, A Mucklich, M M D Ramos and M J M Gomes,

Nanotechnology 23 (2012) 405605 (9pp), 2012 : () 000309506500012 (Collaboration with FMNC)

Statics and Dynamics of Free and Hydrogen-Bonded OH Groups at the Air/Water Interface, *Ana Vila Verde, Peter G. Bolhuis and R. Kramer Campen*,  
The Journal of Physical Chemistry B , 116, 9467 - 9481, 2012 : () 000307264400021

*Tuning the properties of Ge-cluster lattices in amorphous silica matrix through deposition conditions* S R C Pinto, M Buljan, A Chahboun, M A Roldan, S Bernstorff, M Varela, S J Pennycook, N P Barradas, E Alves, S I Molina, M M D Ramos, M J M Gomes  
Journal of Applied Physics, 111, 074316 (2012); doi: 10.1063/1.3702776, : () E000303282402139 (Collaboration with FMNC)

## 2.5.5 Presentations

### Oral presentations in international conferences

The effect of carbon nanotube tip functionalization on electronic tunneling, *presented by Sergey Vladimirovich Pyrlin*, E-MRS 2012 Spring Meeting, — Estrasburgo, Franca, .

Fluid modelling of capacitively coupled radio-frequency discharges: a review , *presented by Luís Silvino Alves Marques*, EPS2012 — Estocolmo, Suecia, .

Computer Modelling os Structure-property relationship in CNT-POLYMER Composites, *presented by Sergey Vladimirovich Pyrlin*, Fisica 2012, 18<sup>a</sup> Conferencia Nacional de Física e 22<sup>o</sup> Encontro Iberico para o Ensino da Física, — Aveiro, Portugal, .

Electrical and Optical Properties of AlN<sub>x</sub>O<sub>y</sub> Thin Films Prepared by Reactive DC Magnetron Sputtering *presented by Filipe Vaz*, Fisica 2012, 18<sup>a</sup> Conferencia Nacional de Física e 22<sup>o</sup> Encontro Iberico para o Ensino da Física, — Aveiro, Portugal, .

Utilização de Ferramentas de Processamento de Imagem para a Aquisicao de Dados no Âmbito do Ensino da Física, *presented by Marta Maria Duarte Ramos* Fisica 2012, — Aveiro, Portugal, .

*When water molecules meet air*, *presented by Ana Celia Araujo Vila Verde*  
Symposium: The Biophysics of Cells and Tissues, — Golm, Alemanha, .

### Poster presentations in international conferences

Controlling the properties of layered self-organized Ge clusters in silica matrix , *presented by Sara Raquel da Costa Pinto*, E-MRS 2012 Spring Meeting, — Estrasburgo, Franca, .

GPGPU-assisted polymer nanocomposite modelling and characterisation , *presented by Sergey Vladimirovich Pyrlin*, E-MRS 2012 Spring Meeting, — Estrasburgo, Franca, .

Multiscale modelling of the influence of phase separation in the functioning of organic photovoltaic devices, *presented by Marta Maria Duarte Ramos*, E-MRS 2012 Spring Meeting, — Estrasburgo, Franca, .

SiGe and Ge nanocrystals embedded in dielectrics for carrier retention applications *presented by Eliana Maria Fernandes Vieira*, E-MRS 2012 Spring Meeting, — Estrasburgo, Franca, .

Capacitively coupled rf coupled plasmas in N<sub>2</sub>-H<sub>2</sub> mixtures , *presented by Luís Silvino Alves Marques*, EPS2012, — Estocolmo, Suecia, .

Experimental characterization of capacitively coupled radio-frequency discharge in N<sub>2</sub>-CH<sub>4</sub> , presented by *Luís Silvino Alves Marques*, ESCAMPIG XXI, — Viana do Castelo, Portugal, .

*RF Capacitively Coupled Plasmas in N<sub>2</sub>-H<sub>2</sub> Mixtures* , presented by *Luís Silvino Alves Marques* ESCAMPIG XXI, — Viana do Castelo, Portugal, .

Computer modelling of the effect of carbon nanofiber/nanotube morphology in polymer on composite mechanical and electrical properties , presented by *Sergey Vladimirovich Pyrlin*, International workshop NANOCARBON COMPOSITES, — Sevilha, Espanha, .

Dynamics of water of hydration near disaccharides strongly depends on solute topology, presented by *Ana Celia Araujo Vila Verde*, Biomembrane Days, — Potsdam, Alemanha, .

Electrical and optical properties of AlN<sub>x</sub>O<sub>y</sub> thin films deposited by reactive DC magnetron sputtering , presented by *Joel Nuno Pinto Borges*, 13th International Conference on Plasma Surface Engineering - PSE2012, — Garmisch-Partenkirchen, Germany, .

Explicar os Fenómenos Físicos da eletrónica orgânica como motivação para a Aprendizagem da Física , presented by *Luís Silvino Alves Marques*, Fisica 2012, — Aveiro, Portugal, .

Influencia da Morfologia da Camada ativa no funcionamento de uma célula Solar Orgânica: um Estudo Computational, presented by *Luís Silvino Alves Marques* Fisica 2012, — Aveiro, Portugal, .

Orientation and dispersion influences on elastic properties of CNT/CNF polymer nanocomposites , presented by *Sergey Vladimirovich Pyrlin*, International workshop NANOCARBON COMPOSITES, — Sevilha, Espanha, .

Principio de Incerteza de Heisenberg no ensino Secundário , presented by *Luís Silvino Alves Marques*, Fisica 2012, — Aveiro, Portugal, .

Effects of annealing on the electrical and optical properties of AlN<sub>x</sub>O<sub>y</sub> thin films , presented by *Joel Nuno Pinto Borges*, 13th International Conference on Plasma Surface Engineering - PSE2012, — Garmisch-Partenkirchen, Germany, .

## 2.5.6 Academic Training PhD

### Theses

Optimização do processo de deposição de óxidos metálicos por pulverização reactiva magnetron *Joel Nuno Pinto Borges*, (on-going)

Modeling the physical properties of nanostructures and composites *Sergey Vladimirovich Pyrlin*, (on-going)

Processos de sinalização na emergência e auto-organização da cooperação *Vítor Vasco Lourenco Vasconcelos*, (on-going)

## 2.5.7 Group Summary

	number
Articles in international journals	6
Oral presentations in international conferences	6
Poster presentations in international conferences	15

## **2.6 Functional Coatings Group**

### **2.6.1 Objectives**

A general goal is the continuation of the research work on nanostructured smart surfaces and thin films to be used in active

devices (smart windows, self-cleaning and bio-systems). The specific objectives include:

Nanocomposites consisting of a dielectric matrix, such as TiO<sub>2</sub>, with embedded noble metals nanoparticles, revealing surface plasmon resonance (SPR) effect.

Development of sensor network devices for mapping the pressure fields at the prostheses/limb interface, especially artificial lower limbs.

Development of the Interdisciplinary Laboratory for Functional Materials (ILFM) in association with the Mechanical department from Minho University. This laboratory will be especially devoted to the jewellery Industry.

TiO<sub>2</sub> nanoparticles will be deposited on pavement roads in order to capture some pollutant gases (NO<sub>x</sub> and CO<sub>2</sub>) emitted by vehicles.

Development of new dye-sensitized solar cells (DSC) produced with TiO<sub>2</sub> nanorod arrays (using dc magnetron sputtering) in order to enhance the photoelectron conversion efficiency.

Syntheses of environmental-friendly thin film coatings for self-cleaning and antimicrobial applications and for photovoltaic applications.

To start the development of a thermal solar coating stacks in collaboration with Savo-Solar Oy company. It is foreseen the optimisation of the nanoparticles deposition source parameters and correlation with the nanoparticle properties for ZnO and TiO<sub>2</sub>.

Development of Biomedical Coatings for Stents Development of a laboratory for corrosion behavior studies of different surfaces using potentiostatic and impedance measurements

PVD coatings on PET substrate for active food packaging Synthesis and control of Ni and Fe<sub>2</sub>O<sub>3</sub> nanocomposites Development of optimized TCO thin films for innovative switchable shading appliances based on nanomaterials and hybrid electrochromic flexible devices, where TCO films deposited on plastics at RT are used as transparent electrodes.

### **2.6.2 Achievements**

Development of photocatalytic coatings with controlled release of volatile agents for applications in road surfaces with self-cleaning ability;

Development of new thin film materials for energy conversion in solar thermal collectors;

Development of new electrochromic devices with low power consumption and reduced response time;

Optimization of structural and optical properties of transparent conductive oxides (TCO) for applications in flexible electronics and photovoltaic solar cells;

Preparation of thin films for applications in pressure sensors and electrodes for acquiring bio-signals;

Development of nanostructured coatings with antimicrobial activity for applications in orthopedic devices;

Fabrication of AAO nanostructures for use in biological systems.

### 2.6.3 Team

Group coordinator: Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro

Group	Grupo de Revestimentos Funcionais/Functional Coatings Group
Coordinator	Joaquim Alexandre Carneiro
Research area	Thin films and materials physics
Institution	Centro de Física da Universidade do Minho

Members	<p><b>Effective members:</b></p> <p>Cacilda Moura – Assistant professor  Carlos Tavares – Assistant professor  Filipe Vaz – Associate professor with aggregation  Joaquim Carneiro – Assistant professor  Luís Cunha – Assistant professor  Luís Rebouta – Associate professor with aggregation  Maria Benelmekki - Researcher (Ciência 2008)  Mário Zamith – Assistant professor  Martin Andritschky – Full professor  Sandra Carvalho – Assistant professor  Stanislav Ferdov - Researcher (Ciência 2007)  Teresa Aroso – Assistant professor  Vasco Teixeira – Associate professor</p> <p><b>Associate members</b></p> <p>Li-Jian Meng – Coordenator professor with aggregation (ISEP)</p> <p><b>Colaborators:</b></p> <p><i>Invcestigators with Phd:</i>  Pedro Carvalho –Seventh Framework Programme Grant (FP7)</p> <p><i>Phd and other students:</i>  Armando Ferreira – FCT Grant  Aníbal portinha – FCT Grant  Carlos Batista – FCT Grant  Cláudia Lopes – FCT Grant (BI)  Cibeli Garcia – FCT Grant  Fernando Ribeiro – FCT Grant  Isabel Carvalho – FCT Grant  Isabel Ferreri – FCT Grant  Mariana Marques – FCT Grant  Noora Manninen -FCT Grant  Rita Rebelo – FCT Grant  Paulo Batista Pedrosa – FCT Grant  Sebastian Calderon Velasquez – FCT Grant  Sofia Azevedo – FCT Grant  Filipa Fernandes – FCT Grant (BI)</p>
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## 2.6.4 Publications

### Articles in international journals

Analysis of multifunctional titanium oxycarbide films as a function of oxygen addition, J.M. Chappe, A.C. Fernandes, C. Moura, E. Alves, N. P. Barradas, N. Martin, J.P. Espinos, F. Vaz, Surf. Coat.Technol. 206, 2525-2534, 2012. : () 000300458500064

Characterization of TiAlSiN/TiAlSiON/SiO<sub>2</sub> optical stack designed by modelling calculations for solar selective applications, L. Rebouta, P. Capela, M. Andritschky, A. Matilainen, P. Santilli, K. Pischow, E. Alves, *Solar Energy Materials and Solar Cells*, 105, 202-207, 2012. : () 000308386000031

*Deposition of ITO thin films onto PMMA substrates for waveguide based biosensing devices*, S. Azevedo, L. Dieguez, P. Carvalho, J.O. Carneiro, V. Teixeira, E. Martinez and J. Samitier, *Journal of Nano Research*, 17, 75-83, 2012. : () 000301027500006

Design and characterization of Ni<sup>2+</sup> and Co<sup>2+</sup> decorated Porous Magnetic Silica spheres synthesized by hydrothermal-assisted modified-Stober method for His-tagged proteins separation, M. Benelmekki, E. Xuriguera, C. Caparros, E. Rodriguez-Carmona, R. Mendoza, J. L. Corchero, S. Lanceros-Mendez, Ll. M. Martinez, *Journal of Colloid and Interface Science*, 365 (1), 156-162, 2012. : () 000296401300021 (Collaboration with FCD).

Development of photocatalytic ceramic materials through the deposition of TiO<sub>2</sub> nanoparticles layers, *J.O. Carneiro, V. Teixeira, S. Azevedo, F. Fernandes and J. Neves*, *Journal of Nano Research*, Vol. 18-19, 165-176, 2012. : () 000309295700016

Effect of filler dispersion on the electromechanical response of epoxy/vapor-grown carbon nanofiber composites, A. Ferreira, P. Cardoso, D. Klosterman, J.A. Covas, F.W.J. van Hattum, F. Vaz, S. Lanceros-Mendez, *Smart Materials and Structures* 21 (2012) 075008. : () 000306002100008 (Collaboration with FCD)

Effect of hot-filament annealing in a hydrogen atmosphere on the electrical and structural properties of Nb-doped TiO<sub>2</sub> sputtered thin films, C.J. Tavares, M.V. Castro, E.S. Marins, A.P. Samantilleke, S. Ferdov, L. Rebouta, M. Benelmekki, M.F. Cerqueira, P. Alpuim, E. Xuriguera, J.-P. Riviere, D. Eyidi, M.-F. Beaufort, A. Mendes, *Thin Solid Films* 520, 2514-2519, 2012. : () 000301085100022 (Collaboration with GCEP)

Electrical Properties of Al<sub>N</sub>xO<sub>y</sub> Thin Films Prepared by Reactive Magnetron Sputtering, J. Borges, N. Martin, N.P. Barradas, E. Alves, D. Eyidi, M.F. Beaufort, J.P. Riviere, F. Vaz, L.Marques, *Thin Solid Films* 520, 6709-6717, 2012. : () 000307286100048 (Collaboration with FCT)

Electromechanical performance of poly(vinylidene fluoride)/carbon nanotube composites for strain sensor applications, A. Ferreira, J.G. Rocha, A. Anson-Casaos, M.T. Martinez, F. Vaz, S. Lanceros-Mendez, *Sensors and Actuators A* 178, 10- 16, 2012. : () 000303087800002 (Collaboration with FCD)

Hydrothermal assisted synthesis of iron oxide-based magnetic silica spheres and their performance in magnetophoretic water purification, C. Caparros, M. Benelmekki, P. M. Martins, E. Xuriguera, C. J. R. Silva, Ll. M. Martinez, S. Lanceros- Mendez, *Materials Chemistry and Physics*, 135, 510-517, 2012. : () 000309247500040 (Collaboration with FCD)

Influence of silver content on the tribomechanical behavior on Ag-TiCN bioactive coatings,

J. C. Sanchez-Lopez, M. D. Abad, I. Carvalho, R. Escobar Galindo, N. Benito, S. Ribeiro, M. Henriques, A. Cavaleiro, S. Carvalho, *Surf. Coatings Technology*, 206, (8-9) 2192-2198, 2012. : () 000300458500020

In-service behaviour of (Ti,Si,Al)<sub>Nx</sub> nanocomposite films, S. Carvalho, N. M. G. Parreira, M. Z. Silva, A. Cavaleiro, L. Rebouta, *Wear*, 274, 68-74, 2012. : () 000301159700009

Magnetophoresis of colloidal particles in a dispersion of superparamagnetic nanoparticles: theory and experiments, M. Benelmekki, Ll M. Martinez, J. S. Andreu, J. Camacho, J. Farauo, *Soft Matter*, 8, (22), 6039-6047, 2012 : () 000304100900011

Mild hydrothermal synthesis, crystal structure, photoluminescence properties and emission quantum yield of a new zirconium germanate with garnet-type structure, S. Ferdov, R. A. S. Ferreira, Z. Lin, Z. Wu, *Journal of Solid State Chemistry*, 190, 18-23, 2012. : () 000304282300004

Nanoparticle Dispersion and Electroactive Phase Content in Polyvinylidene Fluoride/Ni<sub>0.5</sub>Zn<sub>0.5</sub>Fe<sub>2</sub>O<sub>4</sub> Nanocomposites for Magnetoelectric Applications, P. Martins, C. M. Costa, M. Benelmekki, S. Lanceros-Mendez, *Journal of Nanoscience and Nanotechnology*, 12 (8), 6845-6849, 2012. : () 000308379900115

On the origin of the electroactive poly(vinylidene fluoride) beta-phase nucleation by ferrite nanoparticles via surface electrostatic interactions, P. Martins, Carlos M. Costa, M. Benelmekki, G. Botelho, S. Lanceros-Mendez, *Crystengcomm*, 14 (8), 2807-2811, 2012. : () 000301735400024 (Collaboration with FCD)

Piezoresistive response of Pluronic wrapped single wall carbon nanotube D epoxy composites, J.M. Gonzalez-Dominguez, A. Anson-Casaos, M. T. Martinez, A. Ferreira, F. Vaz, S. Lanceros-Mendez, *Journal of Intelligent Material Systems and Structures* 23 (8), 909-917, 2012. : () 000303812100005 (Collaboration with FCD)

Platinum nanoparticles as pH sensor for intelligent packaging *J. Martins, M. Benelmekki, V. Teixeira, P. J. G. Coutinho*, *Journal of Nano Research* 18-19, 97-104, 2012. : () 000309295700009 (Collaboration with FAMO)

Reversible Aggregation and Chemical Resistance of Magnetic Nanoclusters for Their Recycling and Repetitive Use in Industrial Bioprocesses, C. Caparros, M. Benelmekki, A. Montras, S. Lanceros-Mendez, Ll. Martinez, *Journal of Nanoscience and Nanotechnology*, 12 (8), 6707-6711, 2012. : () 000308379900092

Role of Nanoparticle Surface Charge on the Nucleation of the Electroactive beta-Poly(vinylidene fluoride) Nanocomposites for Sensor and Actuator Applications, P. Martins, C. Caparros, R. Goncalves, P. M. Martins, M. Benelmekki, G. Botelho, S. Lanceros-Mendez, *Journal of Physical Chemistry C*, 116 (29), 15790-15794, 2012. : () 000306725200072 (Collaboration with FCD)

Room temperature magnetic response of sputter deposited TbDyFe films as a function of the deposition parameters, L. Rebouta, P. Martins, S. Lanceros-Mendez, J. M. Barandiaran, J. Gutierrez, L. C. Alves and E. Alves, Journal of Nano Research, 18-19, 235-239, 2012. : () 000309295700024 (Collaboration with FCD)

Si doped and un-doped CrN thin films produced by magnetron sputtering: structural and mechanical properties, L. Cunha, C. Moura, Journal of Nano Research, Vol. 18-19, 201, 2012. : () 000309295700020

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Surface Plasmon Resonance Effect on the Optical Properties of TiO<sub>2</sub> Doped by Noble Metals Nanoparticles, M. Torrell, R.C. Adochite, L. Cunha, N.P. Barradas, E. Alves, M.F. Beaufort, Jean Paul Riviere, Albano Cavaleiro, S. Dosta, F. Vaz, Journal of Nano Research 18-19, 177-186, 2012. : () 000309295700017

The influence of annealing treatments on the properties of Ag:TiO<sub>2</sub> nanocomposite films prepared by magnetron sputtering, R.C. Adochite, M. Torrell, L. Cunha, D. Munteanu, E. Alves, N.P. Barradas, A. Cavaleiro, J.P. Riviere, E. Le Bourhis, D. Eyidi, F. Vaz, Applied Surface Science 258, 4028- 4034, 2012. : () 000300185800108

Thermal flexibility of microporous titanosilicate with distorted pharmacosiderite structure, S. Ferdov, Microporous and Mesoporous Materials, 159, 96-99, 2012. : () 000305917700014

TiN<sub>x</sub> coated polycarbonate for bio-electrode applications, P. Pedrosa, E. Alves, N.P. Barradas, P. Fiedler, J. Haueisen, F. Vaz and C. Fonseca, Corrosion Science, 56, 49-57, 2102. : () 000300811100006

TiO<sub>2</sub> coatings with Au nanoparticles analysed by photothermal IR radiometry, Macedo, F; Vaz, F; Torrel, M; Faria, RT; Cavaleiro, A; Barradas, NP; Alves, E; Junge, KH; Bein, BK, J. Phys. D - Appl. Phys., 45 105301 (8 pp) (2012). : () 000301055500005 (Collaboration with GCEP)

## **International Conference Proceedings**

Novel Ti/TiN dry electrodes and Ag/AgCl: A direct comparison in multichannel EEG, P. Fiedler, S. Griebel, C. Fonseca, F. Vaz, L. Zentner, F. Zanow, J. Haueisen, 5th European Conference of the International Federation for Medical and Biological Engineering, IFMBE, Proceedings, Vol. 37 (2012), Part 1, Part 10, 1011-1014, : () 310938200263

## **2.6.5 Presentations**

### **Oral presentations in international conferences**

Workshop - R&D Collaboration in the Food and Manufacturing Sector - — Brussel, Belgica .

Synthesis of Solar-Activated Materials for the Controlled Release of Volatile Compounds, *presented by Carlos Tavares*  
2012 SVC Annual Technical Conference, — Santa Clara Convention Center, Santa Clara, California USA,

*Anodised Nanoporous Alumina Templates*, presented by Anura Priyajith Samantilleke — Alvor - Algarve, Portugal.

Multilayered and Nanocomposite Coatings for Technological and Industrial Applications, *presented by Vasco Teixeira*, XXXIII CBRAVIC, IEAv, S. Jose dos Campos, — SP, Brasil,

TEM studies on TiO<sub>2</sub>/Au thin films grown by magnetron sputtering: the effect of in-vacuum thermal annealing, presented by Filipe Vaz, 13th International Conference on Plasma Surface Engineering, PSE 2012, — Garmish-Partenkirchen, Alemanha, .

Dynamic fatigue tests performed on Ag-ZrCN coatings for orthopedic prostheses *presented by Sabastian Calderon Velasco*, 13th International Conference on Plasma Surface Engineering - PSE — Garmisch, Alemanha.

Mechanisms of Silver Diffusion and Ionization in ZrCN coatings for antibacterial activity on medical devices, presented by Sabastian Calderon Velasco, 13th International Conference on Plasma Surface Engineering - PSE 2012, — Garmisch, Alemanha.

Multifunctional coatings for biomedical applications: challenges and problems, *presented by Sandra Carvalho*, 13th International Conference on Plasma Surface Engineering - PSE 2012, , — Garmisch, Alemanha.

Signal Quality of Titanium and Titanium Nitride Coated Dry Polymer Electrodes, *presented by Filipe Vaz*, BMT 2012 - 46th annual conference of the German Society for Biomedical Engineering — Friedrich Schiller University, Jena University Campus, Jena, Germany,

Evolution of surface plasmon resonance of Au:TiO<sub>2</sub> nanocomposites with annealing temperature, *presented by Filipe Vaz*, E-MRS 2012 Fall Meeting, Symposium K - Highly precise characterization of materials for nano and bio technologies, — Warsaw University of Technology, Poland, .

Modified titanium dioxide functional thin films for self-cleaning and photovoltaic applications, *presented by Carlos Tavares*, 6th Vacuum and Surface Sciences Conference of Asia and Australia (VASSCAA-6), — Islamabad, Pakistan, .

Electrochemical Analysis of Titanium Thin Films for Bioelectrode Applications, *presented by Filipe Vaz*, 7th International Conference on Electromagnetic Processing of Materials (EPM2012), — Beijing, China.

## **Poster presentations in international conferences**

Efficient graphene preparation by combined intercalation exfoliation steps *presented by Peter Schellenberg*, Graphene 2012, — Brussels, Belgium, .

Diffusion mechanism and Ag<sup>+</sup> release kinetics on ZrCN-Ag NP antimicrobial coatings, *presented by Sandra Carvalho*

Properties of MeN<sub>x</sub>O<sub>y</sub> thin films prepared by reactive DC magnetron sputtering, *presented by Joel Nuno Pinto Borges*, E-MRS 2012 Spring Meeting, Symposium U Carbon- or Nitrogen-Containing Nanostructured Thin Films , — Strasbourg, Franca,

Structural modification of TiO<sub>2</sub> nanorod films with an influence on the photovoltaic efficiency of a dye- sensitized solar cell, presented by LiJian Meng  
E-MRS 2012 SPRING MEETING, — Strasbourg, France, .

Properties of Tantalum Oxynitride Thin Films Produced by Magnetron Sputtering: The Influence of Processing Parameters, presented by Luís Antonio Carvalho Gachineiro da Cunha  
14th Joint Vacuum Conference, 12th European Vacuum Conference, 11th Annual Meeting of the German Vacuum Society, 19th Croatian - Slovenian Vacuum Meeting, — Dubrovnik, Croatia.

Structural Stability of Tantalum Oxynitride Thin Films , *presented by Cacilda Maria Lima de Moura*, 14th Joint Vacuum Conference, 12th European Vacuum Conference, 11th Annual Meeting of the German Vacuum Society, 19th Croatian - Slovenian Vacuum Meeting — Dubrovnik, Croatia. .

Corrosion behaviour of titanium with oxynitride coatings in physiological solution, *presented by Filipe Vaz*, XI International Conference and Exhibition on Problems of corrosion and corrosion protection of structural materials - Corrosion-2012, 347 event of the European Federation of Corrosion, — Lviv, Ukraine.

Controlled release of volatile compounds from polymeric capsules mediated by photocatalytic materials, *presented by Paulo Josié Gomes Coutinho*, SPEA7 - 7th European Meeting on Solar Chemistry and Photocatalysis: Environmental Applications, — Porto (Portugal),.

Controlled Release of Volatile Compounds From Polymeric Capsules Mediated by Photocatalytic Materials, presented by Paulo Josié Gomes Coutinho  
7th European Meeting on Solar Chemistry and Photocatalysis (SPEA7), — Hotel Ipanema Park, Porto, Portugal,

Production method of TiO<sub>2</sub> nanorod arrays for dye-sensitized solar cells, *presented by LiJian Meng*  
ChinaOCS-2012, — Dalian, China,

Effect of the compact Ti layer on the efficiency of dye-sensitized solar cells assembled using stainless steel sheets, presented by LiJian Meng, Alvor, Portugal, .

*Electrochemical Self-assembly of Nanoporous Alumina Templates*, presented by Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro, Alvor - Algarve, Portugal: .

Electrical and Optical Behaviour of DC Sputtered Tantalum Oxynitride thin Solid Films, *presented by Senen Lanceros-Miendez*, THE 7th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS: ROCAM 2012, — Brasov, Romania,.

Optical and Structural Properties of Au:TiO<sub>2</sub> Thin Films Prepared by Magnetron Sputtering: The Effect of Thermal Annealing, *presented by Luis Antonio Carvalho Gachineiro da Cunha* THE 7th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS: ROCAM 2012, — Brasov, Romania, .

Preparation and Characterization of Tantalum Nitride and Tantalum Oxide Thin Films: The effect of Structural Features on Decorative Properties, *presented by Luis Antonio Carvalho Gachineiro da Cunha* THE 7th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS: ROCAM 2012, — Brasov, Romania, .

Structural, Optical and Mechanical Properties of Tantalum Nitride Thin Films Prepared by Reactive- Magnetron Sputtering, *presented by Luis Antonio Carvalho Gachineiro da Cunha* THE 7th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS: ROCAM 2012, — Brasov, Romania, .

Electrical and optical properties of AlN<sub>x</sub>O<sub>y</sub> thin films deposited by reactive DC magnetron sputtering , *presented by Joel Nuno Pinto Borges*, 13th International Conference on Plasma Surface Engineering - PSE2012, — Garmisch-Partenkirchen, Germany, .

Optical emission spectroscopy study of a DC magnetron discharge in Ar/(O<sub>2</sub>-N<sub>2</sub>), *presented by Joel Nuno Pinto Borges*, 13th International Conference on Plasma Surface Engineering, PSE 2012, — Garmish-Partenkirchen, Alemanha, .

Silver Doped TiN<sub>x</sub> Nanocomposites: Effect of Composition and Structural Changes in Electrical response of the Films, *presented by Filipe Vaz*, 13th International Conference on Plasma Surface Engineering, PSE 2012, — Garmish-Partenkirchen, Alemanha, .

Biofunctional coatings deposited on electroactive polymers for biomedical applications , *presented by Senen Lanceros-Miendez*, 13th International Conference on Plasma Surface Engineering - PSE 2012, — Garmisch, Alemanha. .

Effect of Annealing Temperature on the Microstructure and Mechanical Properties of Ag-DLC Coatings, *presented by Sandra Carvalho*, 13th International Conference on Plasma Surface Engineering - PSE 2012, — Garmisch, Alemanha. .

Influence of surface features on the adhesion of Staphylococcus epidermidis to Ag-TiCN thin films, *presented by Sandra Carvalho*, 13th International Conference on Plasma Surface Engineering - PSE 2012, — Garmisch, Alemanha..

Effects of annealing on the electrical and optical properties of AlN<sub>x</sub>O<sub>y</sub> thin films , *presented by Joel Nuno Pinto Borges*, 13th International Conference on Plasma Surface Engineering - PSE2012, — Garmisch-Partenkirchen, Germany, .

Growth of the (220) oriented TiO<sub>2</sub> nanorods on ITO substrates by sputtering technique for dye-sensitized solar cells, *presented by LiJian Meng* 12th International Conference on Clean Energy, — Xian, China.

Silver impact on Staphylococcus epidermidis adhesion to Ag-TiCN coatings, *presented by Sandra Carvalho*, II International Conference on Antimicrobial Research - ICAR2012, — Lisboa, Portugal, .

## Presentations in national conferences

*Perspectivas de utilização da nanotecnologia no domínio da segurança rodoviária* presented by Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro Gestao da Velocidade e do Ruído Rodoviario — Guimarães.

Desenvolvimento de Pavimentos Rodoviários com Capacidade Autolimpante *presented by Joaquim Alexandre dos Santos Almeida de Oliveira Carneiro*, Ciencia & Engenharia: Investigacao e inovacao para o desenvolvimento sustentavel — Guimarães,.

Materiais Nanoestruturados e Revestimentos Funcionais para aplicações em Conforto e Segurança, *presented by Vasco Teixeira*, Workshop FIBRENAMICS na PROTECAO PESSOAL — Guimarães.

Synthesis, modification and applications of new crystalline solids with tetrahedral-octahedral frameworks *presented by Stanislav Ferdov*, Jornadas de Física da Universidade do Minho — Braga, Portugal.

Stents Urinaários Inovadores *presented by Sandra Carvalho*, Workshop Biomedical Devices, — Guimarães, Portugal.

Oportunidades e Desafios dos Nanomateriais e da Micro e Nano-tecnologia na Industria de Plasticos *presented by Vasco Teixeira*, XXVIII SEMINARIO de PLASTICOS, APIP- Associacao Portuguesa da Industria de Plasticos — Sweet Atlantic Hotel & Spa, Figueira da Foz.

### 2.6.6 Academic Training

#### PhD Theses

Desenvolvimento de revestimentos multicamada para aplicacoes mecânicas *Anibal*, 2012-12-31

Aplicação e caracterização de nanorevestimentos PVD e de outros materiais com comportamento termo- cromático e hidrofábico em substratos tâxteis, Jose Heriberto Silva, 2012-03-31

Developing of MeNx and MeOy Thin Films (Me-Ti, Zr, Ta and Mo) for Mechanical and Tribological Applications, Dida - Georgiana CONSTANTIN, 2012-09-30

Preparação e caracterização de filmes finos termocromáticos à base de VO<sub>2</sub> para aplicação em janelas inteligentes com control active do espectro solar, Carlos Emanuel Peixoto Batista, (on-going)

Nanobiosensor devices for biomedical applications *Marília Santos*, (on-going)

Optimização do processo de deposição de oxinitretos metálicos por pulverização reactiva magnetrao *Joel Nuno Pinto Borges*, (on-going)

Thin-film silicon solar cells deposited on flexible substrates *Emílio Sergio Marins Vieira Pinto*, (on-going)

Estudo da utilização da microscopia electronica de varrimento em materiais com aplicações emergentes em nanotecnologia, Cibeli Navarro Belleti Garcia, (on-going)

Development of anti-microbial multifunctional coatings based on Ag-Ti(C,O,N) *Isabel Soares de Carvalho, (on-going)*

Development of magnetoelectric polymer based laminated composites *Claudia Sofia Lehman Fernández, (on-going)*

Development of a diffusion barrier for controlling the Ag<sup>+</sup> release on Zr(C,N)-nAg system for antimicrobial activity, *Sabastian Calderon Velasco, (on-going)*

Development of AG-Zr(C,O,N) multifunctional coatings for biomedical devices *Isabel Maria Ferreri Gusmao e Silva, (on-going)*

Estudo das Propriedades Físicas e Eletroquímicas de Filmes Finos Aplicados a sensores de pressão em próteses ortopédicas  
*Cláudia de Jesus Ribeiro Lopes, (on-going)*

Development of multifunctional coatings deposited on polymer substrates *Mariana Marques, (on-going)*

Development of a barrier for controlling the AG<sup>+</sup> release for antimicrobial activity on DLC-nAg-DLC-Au based coatings for biomedical implants, *Noora Manninen, (on-going)*

Conductive thin-film coated flexible polymers: a new materials approach for designing biomedical electrodes and beyond, *Paulo Eduardo T. Batista Pedrosa, (on-going)*

Synthesis and characterization of transitional metal oxynitride multi-functional thin films deposited by reactive magnetron sputtering  
*Daniel Cristea, (on-going)*

Synthesis and characterization of transitional metal oxynitride multi-functional thin films deposited by reactive magnetron sputtering, *Adnana Marin, (on-going)*

Hybrid braided stent with antimicrobial properties *Rita Daniela Nogueira Rebelo, (on-going)*

Desenvolvimento da Tecnologia ETCO e Otimização da Selagem de Células Solares por Laser  
*Fernando Manuel Silva Ribeiro, (on-going)*

### 2.6.7 Group Summary

	number
Articles in international journals	29
International Conference Proceedings	1
Oral presentations in international conferences	12
Poster presentations in international conferences	25
Presentations in national conferences	6
PhD Theses	3

## 2.7 Optics and Vision Science Group

### 2.7.1 Objectives

The group has 5 FCT funded projects and the activity will focus on these projects and on the research in the context of the on-going master and PhD theses. Some important international conferences will be also organized by elements of the group.

### 2.7.2 Achievements

Computational derivation of a "tri-band" illumination with high color rendering;  
Acquiring retina images "in vivo" with photoreceptor visualization;  
Characterization of some types of aberration dynamics in the eye accommodation;  
Characterization of the clinical performance of contact lenses with new liquid solutions;  
Characterization of peripheral refraction and aberrations in eyes subjected to LASIK surgery.

### 2.7.3 Team

Group coordinator: Sérgio Nascimento

Group	Óptica e Ciências da Visão /Optics and Vision Science
Coordinator	Sérgio MC Nascimento
Research area	Óptica e Ciências da Visão
Institution	Centro de Física

<p>Membrs do grupo</p>	<p><b>Effective members:</b></p> <p>Alberto Diaz Rey MD PhD, Assistant professor  Ana Pinho MD, Research and Teaching Assistant  António Baptista PhD, Assistant Professor  António Queirós PhD, Assistant professor  Filipe Costa PhD, Assistant professor  Filipe Macedo PhD, Assistant professor  Jorge Jorge PhD, Assistant professor  José Medina PhD, Researcher Ciência 2007  José Meijome PhD, Associated professor  Madalena Lira PhD, Assistant professor  Sandra Franco PhD, Assistant professor  Sérgio Nascimento PhD, Associated professor</p> <p><b>Associated members:</b></p> <p>Borges de Almeida PhD, Emeritus  Vasco de Almeida PhD, associated from University of Beira Interior</p> <p><b>Collaborators:</b></p> <p><i>Investigators with Phd;</i>  Osamu Masuda PhD, postdoctoral researche</p> <p><i>Phd and other students:</i>  Miguel Jimenes, Ph.D student  Zita Esteves, PhD student  Miguel Ribeiro, PhD student  Ana Pinho, PhD student  Leticia Isla Paradelo, PhD student  Albero Manuel, PhD student  Kishor Sapktota, PhD student  Ram Sah, PhD student  Helena Neves, research assistant (BI) , PhD student  Daniela Ferreira, research assistant (BI)  Cristóvão Macedo, research assistant (BI)  Helder Tiago, research assistant (BI)  Ana Oliveira, research assistant (BI)  Rui Barros, research assistant (BI)  Sofia Matos, research assistant (BI)  José Duarte Gomes, research assistant (BI)  Paulo Fernandes, Ph.D (BI)</p>
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## 2.7.4 Publications

### Articles in international journals

1/f noise in human color vision: the role of S-cone signals, *J.M. Medina, J. A. Diaz*,  
Journal of the Optical Society of America A - Optics, Image Science and Vision, 29(2), A82-A95,  
2012. : () 000300396500010

A Chromatic Diversity Index based on complex scenes. *Linhares, J.M.M., and Nascimento, S.M.C.*  
Journal of the Optical Society of America A - Optics Image Science and Vision, 29, A174-A181  
(2012). : () 000300396500010

Central vault after phakic intraocular lens implantation: correlation with anterior chamber depth, white-to-white distance, spherical equivalent, and patient age. *J.F. Alfonso, L. Fernandez-Vega, C. Lisa, P. Fernandes, J. Jorge, R. Montes Mico.* J Cataract Refract Surg. 38, 1: 46 - 53. 2012. : () 000298713200008

Changes in diadenosine polyphosphates during alignment-fit and orthokeratology rigid gas permeable lens wear. *G Carracedo, JM Gonzalez-Meijome, J Pintor.* Invest Ophthalmol Vis Sci, 53, 8:4426 - 4432. 2012. : () 000307096400013

Contrast edge colors under different natural illumination. *Nieves, J.L., Nascimento, S.M.C. and Romero, J.* Journal of the Optical Society of America A - Optics Image Science and Vision, 29, A240-A246. (2012). : () 000300396500030

Developing experiment-based science teaching skills: A lifelong learning opportunity for teachers in a rural area of Turkey. *Erol, M., Boyuk, U., Sahingoz, R., Harrison, T. G., & Costa, M. F.*  
Energy Education Science and Technology Part B-Social and Educational Studies, 4(4), 2327-2338. (2012). : () 000304504800043

Development of new high transparent hybrid organic-inorganic monoliths with surface engraved diffraction pattern. *Moreira, S., Silva, C. J. R., Prado, L., Costa, M. F. M., Boev, V. I., Martin-Sanchez, J., & Gomes, M. J. M.*  
Journal of Polymer Science Part B-Polymer Physics, 50(7), 492-499 (2012). : () 000300702700005. (Collaboration with FMNC)

Dynamic accommodative response to different visual stimuli (2D vs 3D) while watching television and while playing Nintendo 3DS console. *S Oliveira, J Jorge, JM González-Meijome.* Ophthalmic Physiol Opt, 32, 5:383 - 389. 2012 : () 000307545800004

*In situ corneal and contact lens thickness changes with high-resolution optical coherence tomography.* *JM Gonzalez-Meijome, A Cervião, SC Peixoto-de-Matos, D Madrid-Costa, J Jorge, T Ferrer-Blasco.* Cornea, 31, 6: 633 - 638. 2012 : () 000303941100008

Lighting spectrum to maximize colorfulness. *Masuda, O. and Nascimento, S.M.C.* Optics Letters, 37, 407-409. (2012) : () 000300407600042

Long-term changes in corneal structure and tear inflammatory mediators after orthokeratology and LASIK.

J Gonzalez-Perez, C Villa-Collar, JM Gonzalez-Meijome, NG Porta, Mc Parafita. Invest Ophthalmol Vis Sci, 53, 9:5301 - 5311. 2012. : () 000308695400027

*Long-term evaluation of the central vault after phakic Collamer" lens (ICL) implantation using OCT.*

JF Alfonso, LFernández-Vega, CLisa, PFernandes, JM Gonzalez-Meijome, RMontes-Mico. Graefes Arch Clin Exp Ophthalmol, 250, 12: 1807 - 1812. 2012. : () 000311366200012

Low-frequency correlations (1/f (alpha) type) in paint application of metallic colors  
*J. M. Medina, J. A. Díaz, Optics Express, 20(16), 17560-17565, 2012. : () 000307356300029*

Multiplicative processes and power laws in human reaction times derived from hyperbolic functions,

*J. M. Medina, Physics Letters A, 29(2), A82-A95, 2012. : () 000303360600009*

Optical triangulation-based microtopographic inspection of surfaces. *Costa, M. F. M. Sensors, 12(4), 4399-4420 (2012) : () 000303309300036*

Peripheral Refraction in Myopic Eyes after LASIK surgery, A, Queirós; Cesar, Villa-Collar; J, Jorge; AR, Gutierrez; JM, González-Meijome. *Optometry and Vision Science 89, 7: 977 - 983. 2012. : () 000305894900009*

Pigmented corneal ring associated with orthokeratology in Caucasians: case reports. JM Gonzalez-Meijome, J Gonzalez-Perez, N Garcia-Porta, A Diaz-Rey, MA Parafita-Mato. *Clin Exp Optom, 95, 5: 548 - 552. 2012 : () 000307881000014*

Psychophysical optimization of lighting spectra for naturalness, preference and chromatic diversity. *Nascimento, S.M.C., and Masuda, O. Journal of the Optical Society of America A - Optics Image Science and Vision, 29, A144-A151. : () 000300396500017*

Quality of Life of Myopic Subjects With Different Methods of Visual Correction Using the NEI RQL-42 Questionnaire A, Queiros; Cesór, Villa-Collar; AR, Gutierrez; J, Jorge; JM, González-Meijome.

*Eye & Contact Lens: Science & Clinical Practice 38, 2: 116 - 121. 2012. : () 000300777200008:*

Shedding light on night myopia. N Lopez-Gil, SC Peixoto-de-Matos, LN Thibos, JM Gonzalez-Meijome. *J Vis, 12, 5: 4. 2012. : () 000306336600004*

*Tear film inflammatory mediators during continuous wear of contact lenses and corneal refractive therapy.* González-Perez J, Villa-Collar C, Sobrino Moreiras T, Lema Gesto I, Gonzalez-Meijome JM, Rodríguez- Ares MT, Parafita M. *Br J Ophthalmol.96, 8:1092 - 1098. 2012 : () 000310054100020*

Wavefront analysis and Zernike polynomial decomposition for evaluation of corneal optical quality.

*Oliveira, C M.; Ferreira, A; Franco, S. Journal of Cataract & Refractive Surgery, volume: 38, Pages: 343-356, (2012). : () 000300032200022*

## International Conference Proceedings

Real-time dynamic monochromatic ocular wavefront aberrations during accommodation: preliminary results. Sandra Franco, Cristina M Oliveira, Hólder Tiago Correia, Sergio MC Nascimento, Jose Manuel Borges de Ameida (2012). 2nd IEEE Portuguese Meeting in Bioengineering (ENBENG) Location: Coimbra, PORTUGAL Date: FEB 23-25, 2012. IEEE 2ND PORTUGUESE MEETING IN BIOENGINEERING (ENBENG) Published: 2012. : () 000310431000012

Retinal imaging with photoreceptor resolution. Sergio MC Nascimento, Hólder Tiago Correia, Sandra Franco, Jose Manuel Borges de Ameida (2012). 2nd IEEE Portuguese Meeting in Bioengineering (ENBENG) Location: Coimbra, PORTUGAL Date: FEB 23-25, 2012. 2012 IEEE 2ND PORTUGUESE MEETING IN BIOENGINEERING (ENBENG) Published: 2012. : () 000310431000015

### 2.7.5 Presentations

#### Oral presentations in international conferences

Influência da variação da exposição e da iluminação no tempo de recuperação ao fotostress, *presented by Antonio Manuel Goncalves Baptista*, Congresso Internacional de Optometria e Ciencias da Visão 2012, — Braga, .

School on Advances in Ophthalmic Optics and Optometry, *presented by Antonio Filipe Teixeira Macedo*, Aveiro, .

Visao Binocular,, *presented by Antonio Manuel Goncalves Baptista*

International Summer School on Advances in Ophthalmic Optics and Optometry, — Aveiro, .

Alteraciones de la agudeza visual de alto y bajo contraste con tres tipos de lentes de contacto multifocales hidrofólicas. *presented by Helena Isabel Ferreira Neves*

Conferencia apresentada no 22º Congresso Internacional de Optometría, Contactología y (Óptica Oftálmica, Madrid (Espanha) .

Longitud axial y refracción periférica en miopes progresivos y no progresivos. *presented by Antonio Manuel Marques de Queirós Pereira*, Conferencia apresentada no 22º Congresso Internacional de Optometría, Contactología y Optica Oftálmica, Madrid (Espanha) .

Sintomatologia en pacientes usuários de ortoqueratologia nocturna. *presented by Jose Manuel Gonzalez Meijome*, Conferencia apresentada no 22º Congresso Internacional de Optometría, Contactología y Optica Oftálmica, Madrid (Espanha) .

Peripheral refraction with orthokeratology and other contact lens designs *presented by Jose Manuel Gonzalez Meijome*, Congresso Netherlands Contact Lens Conference, — Eindhoven (Holanda) .

Visual Impairment in Portugal, Do we know the real numbers? Special Interest Group - Low Vision. *presented by Antonio Filipe Teixeira Macedo*, Meeting of the European Academy of Optometry and Optics, — Dublin, .

Alterações da Refração e Parametros Topográficos Corneais na Ortoqueratologia ao Longo de 1 Ano. *presented by Antonio Manuel Marques de Queiros Pereira*, 9th International Conference of Optometry and Vision Science Publication: Proceedings of the 8th International — University of Minho. Braga (Portugal),.

Influence of exposure and luminance variation in photostress recovery time. *presented by Antonio Manuel Goncalves Baptista*, Congresso Internacional de Optometria e Ciencias da Visão, — Braga .

Peripheral refraction with orthokeratology and other contact lens designs, *presented by Jose Manuel Gonzalez Meijome*, 8th Asia Cornea & Contact Lens Conference (ACCLC), — Hong Kong (China) .

Judgments about the intensity of the illumination are influenced by the association between colour and luminance in the scene. *presented by Sergio Nascimento* 2012.CGIV 2012 Sixth European Conference on Colour in Graphics, Imaging, and Vision. Volume 6, ISBN / ISSN: 978-0-89208-299-5, pages 321-324. — Amsterdam, the Netherlands,.

Long-term satisfaction of orthokeratology patients, *presented by Jose Manuel Gonzalez Meijome* 1st EurOK — Universidad Europea de Madrid, Madrid (Espanha) .

Peripheral refraction in Ortho-k, *presented by António Manuel Marques de Queirós Pereira* Conferencia apresentada no 1st EurOK — Universidad Europea de Madrid, Madrid (Espanha) .

Refractive and axial length changes in myopic Singaporean children and adolescents during one year of orthokeratology, *presented by António Manuel Marques de Queirós Pereira* 1st EurOK — Universidad Europea de Madrid, Madrid (Espanha) .

*Lentes de contacto y astigmatismo*, *presented by Josée Manuel González Móejome*, 2º Simposium Internacional de Córnea y Lentes de contacto — Mexico.

Color and light: Surfaces and materials: Surrounding colours influence judgments of surface lightness. *presented by Sóergio Nascimento*, 2012. Annual Meeting of the Vision Sciences Society, Journal of Vision 12(9): 952; doi:10.1167/12.9.952. — Naples..

Night myopia explanation in terms of different stimuli configuration between day and night *presented by Josée Manuel González Móejome*, 6th EOS Topical Meeting on Visual and Physiological Optics (EMVPO 2012) — University College Dublin (UCD), Dublin, Ireland. .

Creativity in the early childhood education. A European perspective and the Portuguese situation, *presented by Manuel Filipe Pereira da Cunha Martins Costa*, 22nd EECERA Conference, — Porto, Portugal, .

*Microtopographic inspection by optical triangulation*, *presented by Manuel Filipe Pereira da Cunha Martins Costa*, Reunion Nacional de Optica, RNO2012, — Zaragoza, Spain, .

Reduction of haloes by reducing the positive spherical aberration of the eye with a silicone hydrogel contact lens, *presented by Josée Manuel González Móejome*, mXXX Congress of the ESCRS 2012, European Society Cataract and Refractive Surgery. — Milao (Italia).

Ambliopia., *presented by António Filipe Teixeira Macedo*, First International Summer School in Ophthalmic Optics and Optometry, — Aveiro, .

Optometric exam in Children. *presented by António Filipe Teixeira Macedo*, First International Summer School in Ophthalmic Optics and Optometry — Aveiro, .

*2nd Portuguese Science Fair Hands-On Science*, presented by Manuel Filipe Pereira da Cunha Martins Costa, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); — Azdeniz University, Antalya, Turkey, .

A Robotic Irrigation System: Motivating Basic School Students To Science, presented by Manuel Filipe Pereira da Cunha Martins Costa,, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); — Azdeniz University, Antalya, Turkey,.

Bot'n Roll Robotic Kit As A Learning Tool For Youngsters presented by Manuel Filipe Pereira da Cunha Martins Costa, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); — Azdeniz University, Antalya, Turkey,.

Creative Little Scientists, presented by Manuel Filipe Pereira da Cunha Martins Costa, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 182-183 (2012) — Azdeniz University, Antalya, Turkey, .

*Different Usability Of Hands-On Physics experiments*, presented by Manuel Filipe Pereira da Cunha Martins Costa, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 200 (2012) — Azdeniz University, Antalya, Turkey,.

PRI-SCI-NET, presented by Manuel Filipe Pereira da Cunha Martins Costa Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 183-184 (2012) — Azdeniz University, Antalya, Turkey,.

Researchers Promote Science In School, presented by Manuel Filipe Pereira da Cunha Martins Costa Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 359-360 (2012) — Azdeniz University, Antalya, Turkey, .

Science Fairs, presented by Manuel Filipe Pereira da Cunha Martins Costa Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 189, 197 (2012) — Azdeniz University, Antalya, Turkey, .

Science Fairs. Teacher Training, presented by Manuel Filipe Pereira da Cunha Martins Costa Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrío BV, Erdogan M, Erentay N (Eds.); pp 188, 194 (2012) — Azdeniz University, Antalya, Turkey,.

## **Poster presentations in international conferences**

ANÁLISIS DE LAS ABERRACIONES PARA DIFERENTES DIÁMETROS PUPILARES EN USUARIOS DE ORTOQUERATOLOGÍA NOCTURNA, presented by Jose Manuel Gonzalez Meijome 22º Congreso Internacional de Optometría, Contactología y Optica Oftálmica, — Madrid (Espanha) .

CAMBIOS EN EL ESPESOR CORNEAL PERIFERICO DESPUES DE LASER IN SITU KERATOMILEUSIS (LASIK) Y QUERATECTOMA FOTORREFRACTIVA (PRK), presented by Antonio Manuel Marques de Queiros Pereira 22º Congreso Internacional de Optometría, Contactología y Optica Oftálmica, — Madrid (Espanha) .

CAMBIOS EN LA ELEVACION EN LA CURVATURA ANTERIOR Y POSTERIOR DE LA CORNEA ANTES Y DESPUES DE ORTOQUERATOLOGÍA CON DIFERENTES LENTES DE CONTACTO *presented by Antonio Manuel Marques de Queiros Pereira*, 22º Congreso Internacional de Optometría, Contactología y Optica Oftálmica, — Madrid (Espanha).

PERFIL HORIZONTAL DE LA RETINA EN MIOPE, EMETROPE E HIPERMETROPE *presented by Jose Manuel Gonzalez Meijome*, 22º Congreso Internacional de Optometría, Contactología y Optica Oftálmica, — Madrid (Espanha) .

REPETITIVIDAD DEL IOLMASTER EN POSICIONES EXCÊNTRICAS DA RETINA *presented by Jose Manuel Gonzalez Meijome*, 22º Congreso Internacional de Optometría, Contactología y Optica Oftálmica, — Madrid (Espanha) .

Binocular superiority in the standard deviation of the threshold contrast detection, *presented by Josie Manuel Medina*, 9th International Conference of Optometry and Visual Sciences (CIOCV 2012), — Braga, .

SINTOMAS VISUAIS EM PACIENTES SUBMETIDOS A TRATAMENTO DE ORTOQUERATOLOGIA NOTURNA, *presented by Antonio Manuel Marques de Queiros Pereira* 9º Congresso Internacional de Optometria e Ciencias da Visão — Braga (Portugal) .

Psychophysical estimation of the best lighting for commercial counters of fruits and vegetables. *presented by Osamu Masuda*, 2012. CGIV 2012 Sixth European Conference on Colour in Graphics, Imaging, and Vision. Volume 6, ISBN / ISSN: 978-0-89208-299-5, pages 272-278. — Amsterdam, the Netherlands,.

CLINICAL PERFORMANCE AND EX-VIVO DEHYDRATION OF SILICONE HYDROGEL CONTACT LENSES WITH TWO NEW MULTIPURPOSE SOLUTIONS, *presented by Josée Manuel González Moeijome* ARVO Global Meeting 2012. — Fort Lauderdale (Florida, USA).

CLINICAL PERFORMANCE AND EX-VIVO DEHYDRATION OF SILICONE HYDROGEL CONTACT LENSES WITH TWO NEW MULTIPURPOSE SOLUTIONS, *presented by Josée Manuel González Moeijome* conferencia da Association for Research in Vision and Ophthalmology (ARVO) 2012. — Fort Lauderdale (EUA) .

OXYGEN DIFFUSION BEHIND MODERN SCLERAL RIGID GAS PERMEABLE CONTACT LENSES *presented by Josée Manuel González Moeijome*, Conferência da Association for Research in Vision and Ophthalmology (ARVO) 2012. — Fort Lauderdale (EUA) .

Temporal Processing in the Peripheral Retina. *presented by António Filipe Teixeira Macedo* ARVO 2012 Annual Meeting, Invest. Ophthalmol. Vis. Sci.;53(6):4830. — Fort Lauderdale, USA,.

THE IMPORTANCE OF STIMULUS CONFIGURATION FOR EXPLAINING NIGHT MYOPIA *presented by Josée Manuel González Moeijome*, conferencia da Association for Research in Vision and Ophthalmology (ARVO) 2012. — Fort Lauderdale (EUA) .

Two routes of suppression of signals in color vision, *presented by Josée Manuel Medina* Vision Science Society Meeting, — Naples, .

3-D REPRESENTATION OF RELATIVE PERIPHERAL REFRACTION ACROSS 360° AFTER ORTHOKERATOLOGY, *presented by António Manuel Marques de Queirós Pereira* 36th British Contact Lens Association (BCLA) Clinical Conference 2012 — Birmingham (Reino Unido) .

3-D REPRESENTATION OF RELATIVE PERIPHERAL REFRACTION ACROSS 360° AFTER ORTHOKERATOLOGY, *presented by António Manuel Marques de Queirós Pereira*

36th BCLA (clinical conference & exhibition), — Birmingham, UK,.

Adaptation Phenomena to Multifocal and Monovision Contact Lens Correction: Biofinity Multifocal vs Monovision? presented by Josée Manuel González Móejome, 36th British Contact Lens Association (BCLA) Clinical Conference 2012 — Birmingham (Reino Unido).

CLINICAL PERFORMANCE AND EX-VIVO DEHYDRATION OF SILICONE HYDROGEL CONTACT LENSES WITH TWO NEW MULTIPURPOSE SOLUTIONS, presented by Josée Manuel González Móejome

36th British Contact Lens Association (BCLA) Clinical Conference 2012 — Birmingham (Reino Unido) .

VISUAL ACUITY CHANGES IN PRESBYOPIC PATIENTS FITTED WITH 3 MULTIFOCAL CONTACT LENSES, presented by Josée Manuel González Móejome, 36th British Contact Lens Association (BCLA) Clinical Conference 2012 — Birmingham (Reino Unido) .

Reflectance variability of surface coatings reveals characteristic eigenvalue spectra, *presented by Josée Manuel Medina*, SPIE Optical Engineering + Application, Reflection, Scattering, and Diffraction from Surfaces III, — San Diego, .

Color and light: Mechanisms: Estimation of the best illumination for commercial food counters. *presented by Osamu Masuda*, Annual Meeting of the Vision Sciences Society, Journal of Vision 12(9): 65; doi:10.1167/12.9.65. — Naples. .

Color and light: Surfaces and materials: Influence of complexity and memory color on naturalness judgments in color rendering. presented by Sergio Nascimento, Annual Meeting of the Vision Sciences Society, Journal of Vision 12(9): 866; doi:10.1167/12.9.866. — Naples. .

Characterization of flexible holographic imprints in urea-silicate and amine-alcohol-silicate matrices with embedded metal nanoparticles. presented by Manuel Filipe Pereira da Cunha Martins Costa EOSAM2012, — Aberdeen, Scotland, .

Effectiveness of Correcting the Spherical Aberration of the Eye: A Contact Lens Model *presented by Jose Manuel González Meijome*, XXX Congress of the ESCRS — Milan (Italy), .

Science In Primary Education In An Ibse Perspective. The Energy Topic, *presented by Manuel Filipe Pereira da Cunha Martins Costa*, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrió BV, Erdogan M, Erentay N (Eds.); pp 355-356 (2012) — Azdeniz University, Antalya, Turkey, .

Science Teaching In Primary Education, With A Ibse Perspective - Water And Environment, *presented by Manuel Filipe Pereira da Cunha Martins Costa*, Proceedings of the 9th International Conference on Hands-on Science. Costa MF, Dorrió BV, Erdogan M, Erentay N (Eds.); pp 354-355 (2012) — Azdeniz University, Antalya, Turkey, .

## **Presentations in national conferences**

Alterações cromáticas e na sensibilidade ao contraste em pacientes com diabetes tipo 2 *presented by Antonio Filipe Teixeira Macedo*, VIII Conferencias Abertas de Optometria da APLO, — Coimbra,.

*Caso clínio: Anisometropia por astigmatismo* presented by Antonio Manuel Goncalves Baptista

VI Colóquio de Optometria e Ciencias da Visao, — Covilha,.

*Escola inclusiva: aluno de baixa visão* presented by Antonio Manuel Goncalves Baptista Congresso Portugues de Reabilitação Visual, — Aveiro,.

Influencia da temperatura, humidade e pílula no BUT, phenol Red e McMonies *presented by Antonio Manuel Gonçalves Baptista*, VIII Conferencias Abertas de Optometria da APLO, — Coimbra,.

Optometria em Portugal um Caminho Rumo ao Sucesso *presented by António Manuel Gonçalves Baptista*, VIII Conferencias Abertas de Optometria da APLO,Coimbra, — Coimbra,.

Prevalência das ametropias em Portugal obtida a partir de prescrições optométricas *presented by Antonio Manuel Gonçalves Baptista*, VIII Conferencias Abertas de Optometria da APLO, — Coimbra,.

Prevalência dos erros refractivos em Portugal usando informação proveniente da venda de receiturario *presented by Antonio Manuel Gonçalves Baptista*, VIII Conferencias Abertas de Optometria da APLO, — Coimbra,.

Real- time dynamic monochromatic ocular wavefront aberrations during accommodation: preliminar re- sults. *presented by Sandra Maria de Braga Franco*, 2nd Portuguese Meeting in Bioengineering. — Coimbra.

Varição do tempo de exposição e iluminância no teste do fotostress. Implicações clínicas *presented by Antonio Manuel Gonçalves Baptista*, VI Coloquio de Optometria e Ciencias da Visao da Universidade da Beira Interior, — Covilhã,.

*Ampliação óptica e não óptica na ajuda à baixa visão* presented by António Filipe Teixeira Macedo Congresso Portugues de Reabilitacao Visual, — Aveiro,.

Retinal imaging with photoreceptor resolution *presented by Sóergio Nascimento* Bioengineering (ENBENG), 2012 IEEE 2nd Portuguese Meeting — .

*Ampliação (óptica e não óptica na ajuda à baixa visão.* presented by António Filipe Teixeira Macedo Congresso Portugues de Reabilitação Visual — Aveiro.

Impacto da ortoqueratologia nos parâmetros topográficos corneais *presented by António Manuel Marques de Queirós Pereira*, Conferencia apresentada no VI Coloquio de Optometria e Ciencias da Visao, — Universidade da Beira Interior (Covilha - Portugal) de.

*Avaliação da função visual na Criança* presented by António Filipe Teixeira Macedo Conferencias Abertas de Optometria — Coimbra.

Fotorefração, presented by Manuel Filipe Pereira da Cunha Martins Costa CAOs 2102 — Coimbra.

Cumprimento em LC: o que sabemos, o que não sabemos e o que precisamos de saber. *presented by Maria Madalena da Cunha Faria de Lira*, VIII Conferencias Abertas de Optometria da APLO. — Coimbra.

Sintomatologia Associada ao uso de computadores: quais as causas *presented by Sandra Maria de Braga Franco*, VIII Conferencias Abertas de Optometria da APLO. — Coimbra,.

## 2.7.6 Academic Training

### PhD Theses

Estudo da variação longitudinal da refração central e periférica e dos componentes ópticos oculares em míopes adolescentes e jovens adultos, Ana Maria Fernandes de Pinho Lopes Dias, (on-going)

Study of optical and structural changes of the eye after refractive surgery with phakic posterior intraocular lens implantation, Paulo Rodrigues Botelho Fernandes, 2012-05-30

Estudio Comparativo de la Eficacia de Cinco Técnicas Mecanizadas de Desgaste Dentário Interproximal. Analisis com Microtopografia Electrónica de Barrido, Pedro Jorge Braga Pereira, 2012-12-31

Um contributo para a integração de atividades de robótica educativa no ensino básico *Celia Rosa Ribeiro, (on-going)*

Organic-inorganic composites with tailored optical properties by doping hybrid matrix with metal nanoparticles, Sandra Daniela Freitas da Costa Moreira, (on-going)

Atividades informais no ensino das Ciências nas Escolas *Zita Quesado Esteves, (on-going)*

Comparison of Two Contact Lens Fitting Strategies for Keratoconus *Miguel Pablo R. Jimenez, (on-going)*, Influência do Diâmetro Pupilar no Rendemento Visual e Optico das Lentes de Contacto Multifocais *Leticia Isla Paradelo, (on-going)*

Avaliação da adaptação a sistemas oftálmicos de adição progressiva para compensação da presbiopia, *Alberto Manuel S. Augusto Alves Silva, (on-going)*

Clinical experimental trials on changes in ocular surface induced by contact lenses wear  
*Kishor Sapkota, (on-going)*

Analysis of light visual distortion and quality of vision with different multifocal lens designs for the compensation of presbyopia, Helena Isabel Ferreira Neves, (on-going)

Alteração da refração periférica para retenção da progressão da miopia  
*Miguel Antonio Faria Ribeiro, (on-going)*

Clinical Performance and Ocular Surface Homeostasis with Gas Permeable Scleral Contact Lens for Severe Ocular Surface Disease, Ram Kishor Sah, (on-going)

### 2.7.7 Group Summary

	number
Articles in international journals	22
International Conference Proceedings	2
Oral presentations in international conferences	32
Poster presentations in international conferences	26
Presentations in national conferences	17
PhD Theses	2

### 3. Annexes



**Universidade do Minho**  
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## COLÓQUIOS DO CENTRO DE FÍSICA 2011-2012



**PALESTRAS  
VISITAS A LABORATÓRIOS  
EXPOSIÇÕES  
OUTRAS ACTIVIDADES**

**16 DE NOVEMBRO DE 2011 (14:30)**  
*O FASCINANTE MUNDO DOS QUASE-CRISTAIS*  
José António Paixão - Departamento de Física,  
Universidade de Coimbra

**7 DE DEZEMBRO DE 2011 (16:30)**  
*A REVOLUÇÃO DAS TECNOLOGIAS DE COMPUTAÇÃO  
E OS DESAFIOS PARA AS NOVAS GERAÇÕES DE  
FÍSICOS COMPUTACIONAIS*  
Alberto Proença - Departamento de Informática,  
Universidade do Minho

**11 DE JANEIRO DE 2012 (14:30)**  
*PLASMA BASED ACCELERATORS AND ULTRA  
COMPACT PARTICLE AND RADIATION SOURCES*  
Luís O. Silva - Instituto Plasmas e Fusão Nuclear (IPFN),  
IST - Universidade Técnica de Lisboa

**1 DE FEVEREIRO DE 2012 (14:30)**  
*CRIOGRAFIA QUÁNTICA*  
Yasser Omar - Departamento de Matemática, ISEG,  
Universidade Técnica de Lisboa

**15 DE FEVEREIRO DE 2012 (14:30)**  
*O UNIVERSO E AS SUAS COMPONENTES ESCURAS*  
Orleu Bertolami - Departamento de Física e Astronomia,  
Universidade do Porto

**14 DE MARÇO DE 2012 (14:30)**  
*DNUNUCLEOTÍDEOS NO OLHO E AS SUAS  
IMPLICAÇÕES CLÍNICAS E TERAPÉUTICAS*  
Jesus Pintor Just - Universidad Complutense  
de Madrid

**11 DE ABRIL DE 2012 (14:30)**  
*O INSTITUTO BIOMÉDICO DE INVESTIGAÇÃO  
DE LUZ E IMAGEM (IBILI)*  
Miguel Castelo-Branco - IBILI, Faculdade  
de Medicina, Universidade de Coimbra

**16 DE MAIO DE 2012 (14:30)**  
*UN PEDAZO DIMINUTO DE REALIDADE  
(A TINY BIT OF REALITY)*  
J. J. Gómez-Cadenas - IFIC, CSIC  
& Universidad de Valencia

**13 DE JUNHO DE 2012 (14:30)**  
*ELECTRONIC AND STRUCTURAL GRAIN  
BOUNDARY PROPERTIES OF CHALCOPYRITE  
SOLAR CELL MATERIALS*  
Sascha Sadewasser - International Iberian  
Nanotechnology Laboratory (INL)

**18 DE JULHO DE 2012 (14:30)**  
*A CIÊNCIA E A ECOLOGIA DOS SABERES NAS SOCIE-  
DADES CONTEMPORÂNEAS*  
Boaventura de Sousa Santos - Faculdade  
Economia, Universidade de Coimbra, Faculdade  
de Direito da Universidade de Wisconsin-Madison

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Universidade do Minho

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Luís Santos A. Marques  
Jorge Manuel M. Jorge  
António Onofre Gonçalves

**MAIS INFORMAÇÕES**  
Resumo  
Perfil do palestrante  
[www.fisica.uminho.pt/coloquios](http://www.fisica.uminho.pt/coloquios)

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4710-057 Braga

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W 8°23'39"

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## COLÓQUIOS 2012-2013 CENTRO DE FÍSICA



[www.fisica.uminho.pt/coloquios](http://www.fisica.uminho.pt/coloquios)

**17 OUTUBRO 2012 (14:30)**  
*O modelo padrão da Física das partículas*  
**Nuno Castro**, LIP - Minho, Universidade do Minho

**14 NOVEMBRO 2012 (14:30)**  
*Em que condições podemos considerar uma nova  
teoria Física como uma emergência forte?*  
**Rui Moreira**, Centro de Filosofia das Ciências da  
Universidade de Lisboa

**12 DEZEMBRO 2012 (14:30)**  
*Correcção refractiva total na cirurgia de catarata*  
**Fernando Silva**, Hospital Privado de Braga e  
Hospital Santa Maria Maior, E.P.E., Barcelos

**16 JANEIRO 2013 (14:30)**  
*Meta-materiais com parâmetros limite: propagação  
de luz sem difracção*  
**Mário G. Silveirinha**, Universidade de Coimbra,  
Instituto de Telecomunicações

**27 FEVEREIRO 2013 (14:30)**  
*Física dos buracos negros*  
**Victor Cardoso**, CENTRA - Instituto Superior  
Técnico

**13 MARÇO 2013 (14:30)**  
*A visual view on the reading deficit in dyslexia*  
**Marieke van Asselen**, IBILI - Faculdade de  
Medicina da Universidade de Coimbra

**10 ABRIL 2013 (14:30)**  
*Nanomedicine and biophotonics: a new frontier  
for Physics*  
**Teresa Petersen**, INL - Iberian Nanotechnology  
Laboratory

**15 MAIO 2013 (14:30)**  
*Electronics at the atomic scale*  
**Joaquin Fernandez-Rossier**, INL - Iberian  
Nanotechnology Laboratory

**12 JUNHO 2013 (14:30)**  
*Efeitos quânticos em Biologia*  
**Michael Scott Belsley**, Departamento de Física  
da Universidade do Minho

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**MAIS INFORMAÇÕES**  
Resumo / Perfil do palestrante  
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imagens, cortesia do A. Ledermann and G. von Freymann, Karlsruhe Institute of Technology



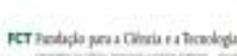




**26 de Outubro de 2012**  
 Auditório da Escola de Ciências  
 Campus de Gualtar, Braga

### Programa das Jornadas do Centro de Física 2012

26 Outubro de 2012 (sexta-feira)	
<b>Manhã</b>	
9:30 - 9:45	<b>Abertura</b>
9:45 - 10:20	"Graphene plasmonics" Yuliy Bludov, CFUM
10:20 - 10:55	"Counting statistics of fractional charges transferred through interacting electron systems" Vadim Ponomarenko, CFUM
10:55 - 11:20	Intervalo café
11:20 - 11:55	"Electronic doping of graphene by deposited transition metal atoms" Jaime Santos, CFUM
11:55 - 12:30	"Synthesis, modification and applications of new crystalline solids with tetrahedral-octahedral frameworks" Stanislav Ferdov, CFUM
<b>Tarde:</b>	
14:00 - 14:35	"Method of Monte Christo in Physics: New polar phenomena in electrospun nanofibers" Dmitry Isakov, CFUM
14:35 - 15:10	"From extremophiles to protein-based-polymers: fundamental and applied aspects" Tony Collins, CBMA
15:10 - 15:45	"Biophysical approaches towards the elucidation of molecular mechanisms underlying programmed cell death" Susana Chaves, CBMA
15:45 - 16:15	Intervalo café
16:15 - 16:50	"The Femtosecond Laser Lab: Experiments, Perspectives and Challenges" Peter Schellenberg, CFUM
16:50 - 17:50	"Horizonte 2020 - perspectivas para formação avançada - Marie Curie e ERC" Ana Mafalda Dourado, FCT
17:50 - 18:00	Sessão fecho



## Seminários de Física 2012

Convidam-se todos os interessados a assistir à palestra do Doutor *Ivan Larkin* (Centro de Física da Universidade do Minho), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na próxima quarta-feira dia 29 de Fevereiro, às 14h00, e tem como título **“*Visualisation of wave function of quantum dot at Fermi-edge singularity regime*”**

Convidam-se todos os interessados a assistir à palestra do Doutor *J. Fernández-Rossier* (International Iberian Nanotechnology Laboratory-INL), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na próxima sexta-feira dia 23 de Março, às 14h30, e tem como título **“*Atomic Scale Spintronics*”**

Convidam-se todos os interessados a assistir à palestra do Doutor *J.-E. Wegrowe* (Ecole Polytechnique, LSI, CNRS and CEA/DSM/IRAMIS, Palaiseau, France), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida na sala CP11-209, na próxima sexta-feira dia 20 de Abril, às 14h30, e tem como título **“*Magnetization dynamics, gyromagnetic relation, and inertial effects*”**

Convidam-se todos os interessados a assistir à palestra de *Raphael Lopes* (Laboratoire Charles Fabry, Institut d'Optique Graduate School Palaiseau, France), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na próxima sexta-feira dia 27 de Abril, às 14h30, e tem como título **Analog of dynamical Casimir effect with matter waves”**

Convidam-se todos os interessados a assistir à palestra do Doutor *Alexey Dronov* (Department of Materials and Physical Chemistry, National Research University Moscow Institute of Electronic Technology (MIET), Moscow, Russia and Department of Materials Engineering and Ceramics, University of Aveiro, Portugal), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na próxima sexta-feira dia 18 de Maio, às 14h30, e tem como título **“*Ways to improve the efficiency of new generation solar cells through modifying the composition and morphology of titanium oxide layers*”**

Convidam-se todos os interessados a assistir à palestra do Doutor *Jaime Santos* (Centro de Física da Universidade do Minho), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na próxima terça-feira dia 22 de Maio, às 16h00, e tem como título **“*The probability distribution for the work performed by a rotating wave on a two-level system*”**

Convidam-se todos os interessados a assistir à palestra do Prof. *C. Trallero-Giner* (Department of Theoretical Physics, University of Havana, Cuba), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Química, na próxima sexta-feira dia 22 de Junho, às 14h30, e tem como título **“Elementary excitations of Bose-Einstein condensates”**

Convidam-se todos os interessados a assistir à palestra de *Marlos Viana* (University of Illinois at Chicago Eye Center, USA), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Química, na segunda-feira dia 2 de Julho, às 15h00, e tem como título **“Symmetry Considerations in Statistical Optics”**

Convidam-se todos os interessados a assistir à palestra de *Monica Garcia* (Departamento de Física, Facultad de ciencias Físicas y Matemáticas. Universidad de Chile), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na quarta-feira dia 4 de Julho, às 14h30, e tem como título **“Origin of the Pinning of Drifting Monostable Patterns”**

Convidam-se todos os interessados a assistir à palestra de *André Pasa* (Departamento de Física, Universidade Federal de Santa Catarina, Florianópolis - Santa Catarina - Brasil), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida na sala 309 do Complexo Pedagógico I, na terça-feira dia 16 de Outubro, às 14h30, e tem como título **“Normal versus anomalous roughening of electrodeposited Prussian Blue thin films”**

Convidam-se todos os interessados a assistir à palestra de *Ivan Larkin* (Centro de Física da Universidade do Minho), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro do Departamento de Física, na quarta-feira dia 10 de Outubro, às 14h30, e tem como título **“‘Magnetic Gradient’ edge magnetoplasmons in non-uniform magnetic field”**

Convidam-se todos os interessados a assistir à palestra do Prof. *Álvaro Damião* (Instituto de Estudo Avançados (IEAv), São José dos Campos - SP - Brasil), no âmbito dos Seminários de Física, organizados pelo Centro de Física da Universidade do Minho.

A palestra será proferida no Anfiteatro de Química, na segunda-feira dia 19 de Novembro, às 11h30, e tem como título **“IEAv: Tecnologias para facilitar o acesso ao espaço”**

### **Steering Committee of the Physics Centre at Minho (CFUM), February 16-17, 2012**

Report following the meeting of the Steering Committee of the Physics Centre at Minho (CFUM), February 16-17, 2012:

The steering committee congratulates CFUM for the well organized presentation of the Center and its research groups, and the visit to the facilities.

As a whole the research center has increased its visibility in terms of number of publications, impact factor, attracting postdoctoral researchers and graduate students from abroad. The center has maintained a good (at the national standard) level of funding during the past three years keeping an active research environment. The Center's outreach activity has been good, however, an enhancement of the web page visibility is recommended.

The central SEMAT facility is impressive and shows state of the art structural characterization equipment at U.Minho. On the other hand, the steering committee feels that parts of the research infrastructure of CFUM are in need of replacement/upgrade considering that the last re-equipment program was almost 10 years ago.

Research activity is devoted to Solid State Physics, Thin Films and Applications, Atomic and Molecular Physics, Fundamental and Applied Optics, and Optoelectronics. All of these areas combine fundamental and applied interest. The steering committee was particularly impressed by the performance of the Functional Coatings Group, The Complexity and Electronic Properties Group, The Atomic and Molecular Physics Group, the Optics and Vision Science group, and the Cooperative Phenomena in Dielectrics Group. The Physics of Nanocrystalline Materials Group (PNMC) and the Computational and Theoretical Physics Group (CTP) need an increase of their research impact (#publications and funding level). In particular, for the latter group (CTP) it would be desirable to streamline their activities in order to increase the scientific impact of their work and possibly funding. The multiscale approach is certainly of much interest, such that a concentration along these lines, paying attention to fundamental questions related to transport in mesoscopic devices, could enhance the scientific visibility of the group.

Enhanced collaboration with the other groups, bringing complementary methods to the areas which are already successful in the Center might also be good ways forward. We expect that improving their scientific activities in the way described above, these two groups become more efficient in attracting research funds.

The steering committee sees that increased collaboration among the different groups of CFUM is desirable, and necessary in order to share existing facilities. The new larger scale FCT projects are a good opportunity for that. Collaborations with other research units at the university (engineering and health schools) and with the new nanotechnology laboratory are also recommended. Optimization of the existing facilities with similar purpose is suggested.

As strong points, we recognize the industrial collaboration of the Functional Coatings and Optics and Vision Science groups, the international impact of the Complexity and Electronic Properties group, and the application driven activity in the Cooperative phenomena in Dielectrics group.

The steering committee expects that CFUM will continue to improve their scientific activity and funding level (from all sources) as well as improving the attractiveness for new doctoral and post doctoral researchers, both national and from abroad.

Jon Otto Fossum  
Paulo Jorge Peixeiro de Freitas  
Alejandro Muramatsu  
Konstantin Novoselov