Centre of Physics of the University of Minho

Activity Report 2017

February 2018

Índex

1. Introduction

1.1 General description of the Centre

The Physics Centre of Minho University (CFUM) is a research unit with a multi-disciplinary scientific activity in the fields of Pure and Applied Physics and adjacent areas. CFUM was founded in 1994 and recognized by the Portuguese Foundation for Science and Technology (FCT) in 2003. Since 2015 CFUM is a part of the Centre of Physics of Minho and Porto Universities (CF-UM-UP), a joint research unit officially approved by the FCT. The part based in Porto is composed of theorists working within the strategic research line "Quantum Physics and Fields in High Energy and Condensed Matter Theory". The research at the CFUM itself is conducted along the following three Lines:

(i) Assessment and enhancing visual performance,

(ii) Plasmonic, luminescent, magnetic and hybrid nanostructures for optoelectronic, biomedical and environmental applications[1]., and

(iii) Functional and smart materials and surfaces for advanced applications.

At present, CFUM includes 69 members with PhD of which 45 are UM teaching staff members (meeting the selection criteria of minimum scientific production), 3 are experienced researchers ("Investigador FCT") and 21 are Post-Docs. Also there are 40 PhD students affiliated to CFUM and a number of collaborators with and without PhD (see Sections 2 and 3 for detailed information). The research at CFUM is in the fields of Materials Physics (both theoretical and experimental), Materials Fabrication and Applications, Optics, Biophysics, Optometry and Vision Sciences, with 10-15% of theoretical research and modelling and the reminder representing experimental research and development activities. CFUM is strongly involved in interdisciplinary R&D activities and the team includes Physicists, Materials Scientists, Mathematicians (a group of five staff members of the Department of Math joined CFUM in December of 2017), and specialists in Optics (including that of human eye) and Optometry. There are currently 30 research laboratories located in two UM campi. Each laboratory has a responsible person among Centre's integrated members. Technical support is provided by the personnel of the UM School of Sciences (one electronics technician, one engineer supporting the labs devoted to thin film deposition, and five general technicians).

CFUM's managing bodies are: (i) Director, elected among the Full or Associate Professors of the Physics Department, every three years via direct election, (ii) Deputy Director (appointed by the Director), (iii) Executive Committee, (iv) Scientific Council, composed by all effective members holding a PhD, and (v) Steering Committee, an advisory board constituted by internationally recognized scientists that help to evaluate and improve the Centre's activities (see Section 2 for detailed information).

1.2 Summary and brief analysis of scientific performance in 2017

The most positive result of 2017 is that CFUM researchers have been able to resume all their laboratory activities in the School of Sciences building in Gualtar in September, since most of them had been interrupted by maintenance works for nearly one year. Funding received from different sources increased in 2017 as compared to 2016 (for instance, 219 899,20 € for expenses covered by the Strategic Project in 2017 against 57 699,52 €

[1] This Research Line recently changed its name to "Physics of quantum materials and bionanostructures".

in 2016, also a two-fold increase in the overall amount of expenses paid by individual FCT projects, see also Graphs 8 - 10). The number of ongoing projects remained stable, with the FCT continuing to be the main funding entity (over 50% of the total, Graph 7)[2] .

The FCT funding allowed us to invest a considerable amount into fellowships awarded, through a competitive call, to the best graduate students. Most of them developed fairly good research projects, which yielded valuable scientific results and contributed to the Centre's visibility. For instance, one of the 2017 fellowship holders, Eduardo Dias already co-authored several articles published in high impact journals. Another fellowship holder, André Souto won an SPIE Best Student's paper award for his oral presentation in the international conference AOP2017. Also thanks to the stabilized funding, the Centre has been able to resume some of its outreach activities, such as the Physics Colloquia with four high-quality lectures delivered in 2017, targeting broad publics including undergraduate students. Also, CFUM members organized several international conferences in Braga, such as the annual 14-th International Congress of Optometry and Vision Sciences, the 8th International Conference on Nanoscience with Nanocrystals (NANAX8), and the 14th International Conference on Hands-on Science.

The year of 2017 was rather successful in terms of completed PhD theses (16 against 13 in 2016 and 8 in 2015). The total number of PhD students, including those performing their projects at the Centre of Physics and also external students (co-)supervised by CFUM researchers, also increased (58 against 50 in 2016). Yet, these numbers should be taken with a caution because many of these PhD students are shared with other research centres and aproximently half of them are enrolled on PhD programs outside the School of Sciences (mostly at the School of Engineering). For instance, only 30 PhD students were confirmed as "integrated participants" of the recently submitted application of the CFUM for the next evaluation of R&D units by the FCT.

The scientific production of the CFUM in 2017 decreased compared to 2016 (see Table 5.1 and Graphs 2 and 3). This is mostly a phase-shifted effect of the insufficient and irregular funding over a number of recent years. In particular, the Strategic Funding (or any other funding of the Centre as a whole) was interrupted in 2014, being exactly zero in 2015 and in the first semester of 2016. Moreover, the restrictions that now apply to acquisitions of new scientific equipment (related to its partial amortization during a number of years) limit the possibilities of updating Centre's research facilities, while the last national Re-equipment Program took place almost 15 years ago. Unfortunately, industry-funded projects continue to have only a marginal weight in the overall budget of the Centre of Physics, although there are expectations that the large-scale cooperation project between the University of Minho and Bosch can become an important exception to this rule.

A too broad spectrum of research topics has been a chronical problem of the Centre, indicated by all Evaluation Panels and Steering Committees. The proposed solution is focusing our research along fewer research lines based on three main pillars of the sustainability of the CF-UM-UP in the recent years, which are:

(1) Theoretical research in the physics of 2D materials;

(2) Research in new materials targeting technologies and applications within the "low cost – reasonable performance" paradigm;

(3) Research in Optometry and Vision Science using state of the art optical equipment and modelling to address some of the major societal challenges involving ocular health and vision.

The Executive Commission of the Centre tries to use the (limited) stimuli at hand to direct the research along these lines and also to keep a reasonable balance between the fundamental and applied research. One such measure is screening the publications of Centre's members against "relevance criteria" by using sets of keywords characteristic of each Research Line. These keywords were defined and applied this year for the first time. As a

[2] Except the number and funding of bilateral projects that continued to decrease.

result, the articles which are outside of the recognized research topics (listed as "Other articles" in this Report), will not be considered for the distribution of funds coming in the framework of Centre's Strategic Project. The Executive Commission intends to continue this exercise in the future and improve the key words definition in order to make this instrument more efficient.

Another problem of the Centre is the highly unequal research and publication activity of the members. This year, despite slightly improved in comparison with the previous year, the distribution of the members' publication rates is uneven with as many as 27% of PhD members published no articles in 2017 (see Graph 4). The low activity in research demonstrated by a considerable number of teaching staff members can be explained in part by the fact that academic career progress has virtually been blocked in Portuguese universities for almost a decade and by the increasing difficulties in obtaining funds (very low approval rate of scientific proposals) in the last 10-12 years. Even though these factors are objective and do not promote the proactivity of teaching staff members in research, the Centre will continue the policy of applying the minimum scientific production criteria for being its effective member.

(http://www.fisica.uminho.pt/Default.aspx?tabid=8&pageid=439&lang=pt-PT)

The updated composition of the Research Lines presented in this Report.

While the Report was being prepared, several positive news have arrived, such as the reinforced FCT Strategic Funding for 2018 (plus 170 k€), the nomination of José Manuel Meijome, the Coordinator of one of our Research Lines, for the Research Merit Award by the University of Minho, and the L'Oreal Portugal Award for Woman in Science attributed to Margarida Fernandes, a Post-Doctorate researcher at the CFUM. Moreover, new opportunities exist associated with the just closed (individual) and two forthcoming (institutional) calls for hiring researchers with PhD along with re-opening of teaching staff hiring and promotion contests, which create expectations that CFUM may get a new impulse and recover its high research dynamics and further increase its international recognition and visibility in 2018.

Mikhail Vasilevskiy

2. Organisation

Members of the Centre

Effective Members with Ph.D	48
Post-Docs and Research Fellows with PhD	21
Ph. D Students	41

Management Entities

Director:
Mikhail Vasilevskiy

Deputy Director:
Luís Rebouta

Executive Committee Members:

1. Paulo Coutinho
2. José Meijome
3. Senen Lanceros-Mendez / Martin Andritschky

Members of the Scientific Council (effective CFUM members):

1. Anabela Gomes Rolo
2. António Baptista
3. António Macedo
4. António Queirós Pereira
5. Bernardo Gonçalves Almeida
6. Cacilda Moura
7. Carlos Tavares
8. Diego Martinez
9. Elisabete Maria dos Santos Castanheira Coutinho
10. Etelvina de Matos Gomes
11. Francisco José Machado de Macedo
12. Gaspar Machado (joined in December 2017)
13. Gueorgui Vitalievitch Smirnov
14. João Manuel Maciel Linhares
15. João Pedro Santos Hall Agorreta Alpuim
16. Joaquim Carneiro
17. Jorge M. Martins Jorge
18. Jorge Figueiredo (joined in December 2017)
19. José Filipe Vilela Vaz
20. José M. González Méijome
21. Luís Cunha
22. Luís Manuel Gomes Vieira
23. Luís Rebouta
24. Luís Silvino Alves Marques
25. Madalena Lira
26. Manuel Filipe Costa

27. Maria de Fátima Guimarães Cerqueira
28. Maria Elisabete da Cunha Dias Real Oliveira
29. Maria Jesus Gomes
30. Mário Pereira
31. Mário Rui da Cunha Pereira
32. Marlene Susana Dionísio Lúcio
33. Marta Maria Duarte Ramos
34. Martin Andritschky
35. Michael Scott Belsley
36. Mikhail Igorevich Vasilevskiy
37. Nuno Miguel Machado Reis Peres
38. Paulo José Gomes Coutinho
39. Ricardo Pedro Lopes Martins de Mendes Ribeiro
40. Rui Pereira (joined in December 2017)
41. Sandra Carvalho
42. Sandra M. Braga Franco
43. Senentxu Mendez
44. Sérgio M. Cardoso Nascimento
45. Sofia Lopes (joined in December 2017)
46. Stanislav Ferdov
47. Stephane Louis Clain (joined in December 2017)
48. Vasco Teixeira

Colaborators with PhD – staff members

1. Ana Maria Pinho
2. António Mário Almeida
3. Daniela Patricia Lopes Ferreira
4. Jorge Mendes (Instituto Politecnico de Vila do Conde)
5. José Alberto Díaz Rey
6. José Carlos Viana Gomes
7. José Luis Ribeiro
8. Júlia Maria Simões Dias Barata de Tovar Ayres de Campos
9. Li-Jian Meng (ISEP)
10. Maria José Sampaio
11. Maria Teresa Pitta de Lacerda-Arôso
12. Mário Zamith
13. Teresa Maria Santos Ribeiro Viseu
14. Vasco Almeida (UBI)

Colaborators with PhD - Post-Docs

1. António Francesko –SFRH/BPD/104204/2014 (100%)
2. Armando Ferreira –SFRH/BPD/102402/2014 (100%)
3. Carlos Costa –SFRH/BPD/112547/2015 (100%)
4. Catalina Mansilla –SFRH/BPD/105068/2014 (100%)
5. Clarisse Ribeiro –- SFRH/BPD/90870/2012 (100%)
6. Filipe Daniel Fernandes - SFRH/BPD/116334/2016 (100%)
7. Isabel Carvalho –- Projeto nº 006684 - Minho-BIO/04469 (50%)

8. Jaime Santos–Project Uminho/Bosch (UMINHO/BI/214/2016) (50%)
9. Joel Borges - SFRH/BPD/117010/2016 (85%)
10. José Pedro Basto da Silva –SFRH/BPD/92896/2013 (50%)
11. Margarida Fernandes - SFRH/BPD/121464/2016 (70%)
12. Miguel Ribeiro - SFRH/BPD/116351/2016 (100%)
13. Paulo Rodrigues Botelho Fernandes –SFRH/BPD/92365/2013 (100%)
14. Pedro Costa –SFRH/BPD/110914/2015 (50%)
15. Pedro Libanio Martins–SFRH/BPD/96227/2013 (100%)
16. Paulo Pedrosa - UMINHO/BPD/26/2017 (100%)
17. Sebastian Calderon Velasco – ERA-SIINN/0004/2013 (UMINHO/BPD/11/2016) (100%)
18. Sergey Pyrlin – European project TheLink (UMINHO/BGCT/08/2016) (100%)
19. Vanessa Cardoso – SFRH/BPD/98109/2013 (30%)
20. Vitor Correia – SFRH/BPD/97739/2013 (50%)
21. Yuliy Bludov – European Project Graphene FPA – 649953 (UMINHO/BPD/20/2016) (100%)

PhD Sudents

1 . Abbas M.k. AL-Rjoub – Map -Fis Phd Program
2. Alshaarawi M. A. Salem - OCV Phd Program
3 . Ana Isabel Amorim de Sousa - OCV Phd Program
4 . Ana Rita Oliveira Rodrigues - Map -Fis Phd Program – FCT Fellowship
5 . Ana Catarina Branco Lima
6 . André Chaves - Science Phd Program – CAPES Fellowship
7 . Atilla Goren - Science Phd Program – FCT Fellowship (Defended December 2017)
8 . Balaji Sompalle - Map -Fis Phd Program
9 . Bruna Ferreira Gonçalves - Science Phd Program – FCT Fellowship
10. César Bernardo - Map -Fis Phd Program – FCT Fellowship
11. Cláudia de Jesus Ribeiro Lopes - Science Phd Program – FCT Fellowship
12. Cristiana Alves - Engeneering Phd Program – FCT Fellowship
13. Daniel António da Silva Miranda - Science Phd Program (Defended June 2017)
14. Diogo Cavaleiro – Engeneering Phd Program – Project Fellowship
15. Edgar Carneiro - Engeneering Phd Program – Project Fellowship
16. Eliana Tiba Gomes Grande - Science Phd Program (Defended 2017)
17. Filipe André Peixoto Oliveira - Map -Fis Phd Program – FCT Fellowship
18. Filipe da Costa Correia - Engeneering Phd Program – FCT Fellowship
19. Gabriel Mendes - Engeneering Phd Program – FCT Fellowship (Defended 2017)
20. Hugo Gonçalves - Map -Fis Phd Program – FCT Fellowship
21. Hugo Salazar FCT, SFRH/BD/122373/2016
22. Ícaro Jael Mendonça Moura - Map -Fis Phd Program – CAPES Fellowship
23. Isabel Cristina Azevedo Machado de Araújo - Science Phd Program
24. Jivago Nunes - Engeneering Phd Program – FCT Fellowship
25. Juliana Dias - Science Phd Program
26. Juliana Filipa Gouveia Marques - Engeneering Phd Program – FCT Fellowship
27. Juliana Oliveira - Engeneering Phd Program – FCT Fellowship
28. Laura Hernández Moreno - OCV Phd Program
29. Lina Maria Rodrigues Cely - OCV Phd Program
30. Luísa Fialho - Engeneering Phd Program – Project Fellowship
31. Marco Pires Rodrigues – Map-Fis– FCT Fellowship
32. Marta Adriana Forte, PhD Student Doctorate Program
32. Nuno Miguel Teles Oliveira - Science Phd Program – FCT Fellowship

34. Pedro Lima - Science Phd Program – FCT Fellowship
35. Ricardo Sousa - Science Phd Program – FCT Fellowship (Defended November 2017)
36. Rute Juliana Ferreira Macedo de Araújo – OCV Phd Program
37. Santiago Escandón Garcia - OCV Phd Program (Defended July 2017)
38. Sara Filomena Ribeiro Pimenta - Science Phd Program – FCT Fellowship (Defended February 2017)
39. Sylvie de Oliveira Ribeiro
40. Veniero Lenzi - Science Phd Program – Project Fellowship
41. Vitor Vasconcelos - Science Phd Program – FCT Fellowship (defended February 2017)

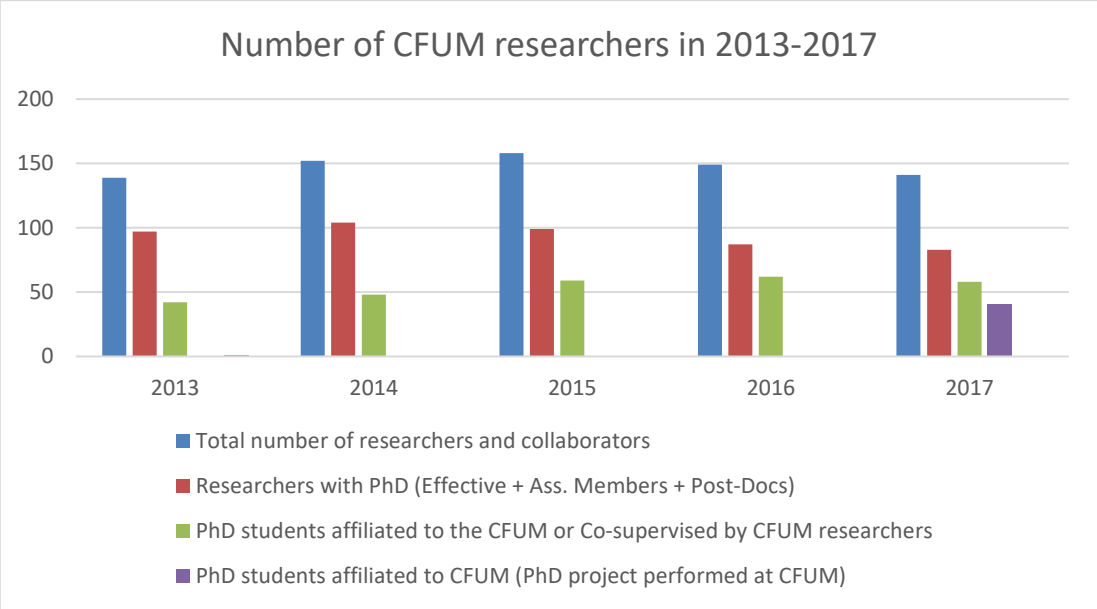
Advisory Board

- Prof. Sir Konstantin Novoselov, School of Physics & Astronomy, University of Manchester, Manchester, United Kingdom.

- Prof. Antti-Pekka Jauho, Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark.

- Prof. Emeritus Denis Weaire, School of Physics, Trinity College, Dublin.

- Prof. Norberto López-Gil, Department of Physics, University of Murcia, Spain.



Graph. 1 Number of CFUM researchers and collaborators in the last five years

3. Strategic Research Lines

Strategic Research Lines	Coordinator
Assessment and enhancing visual performance	José Meijome
Plasmonic, luminescent, magnetic and hybrid nanostructures for optoelectronic, biomedical and environmental applications	Paulo Coutinho
Functional and smart materials and surfaces for advanced applications	Senen Lanceros-Mendez / Martin Andritschky

4. Facilities and Infrastructure

4.1 Research Laboratories

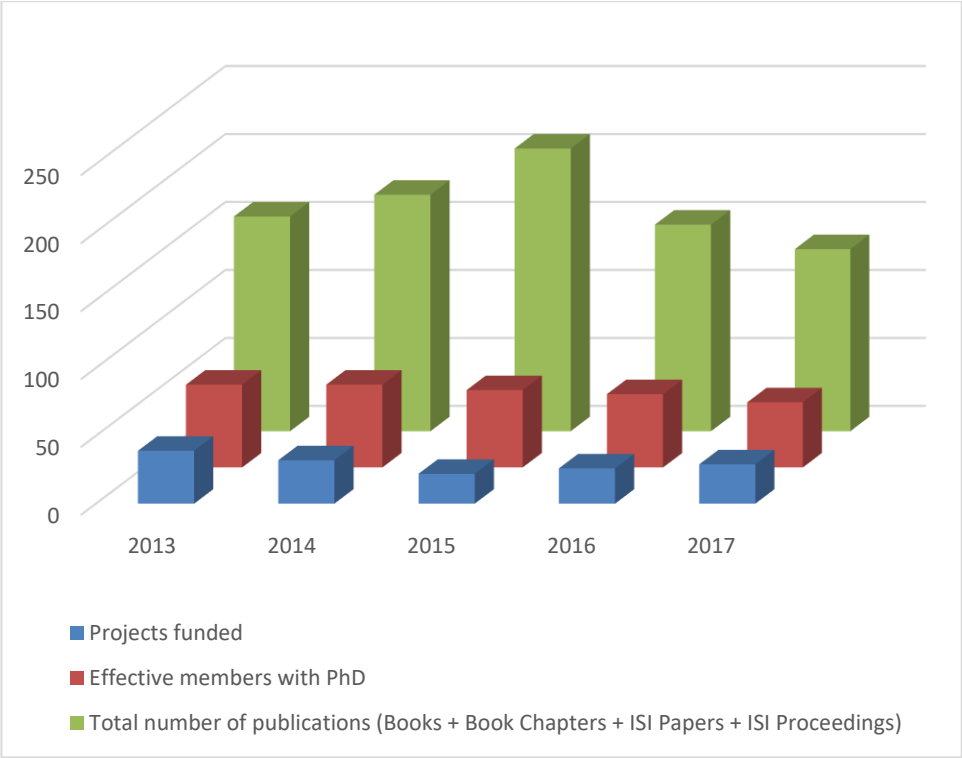
Laboratory – location	Research Line	Responsable
Biophysics – Gualtar	Line 2	Paulo Coutinho
Ceramics Research – Azurém	Line 3	Mário Pereira
Computational Physics – Gualtar	Line 3	Luís Silvino Marques
Corrosion and electrochemical testings – Azurém	Line 3	Sandra Carvalho
Crystal Growth – Gualtar	Line 3	Etelvina de Matos Gomes
Doelectric Properties – Gualtar	Line 3	Bernardo Gonçalves Almeida
Electromechanical properties of materials – Azurém	Line 3	Senen Lanceros-Mendez
Femtosecond Laser Spectroscopy –Gualtar	Lina 2	Michael Belsley
Fluorescence Lifetime Measurements – Gualtar	Line 2	Mário Rui Pereira
Functional Coatings I – Azurém	Line 3	Martin Andritschky
Functional Coatings II – Azurém	Line 3	Luis Rebouta
Functional Coatings III – Azurém	Line 3	Filipe Vaz
Infrared Spectroscopy – Gualtar	Line 2	Luís Vieira
Magnetic and Electromechanical Properties – Gualtar	Line 2	Bernardo Gonçalves Almeida
Materials Processing – Azurém	Line 3	Stanislav Ferdov
Microtopography – Gualtar	Line 3	Manuel Filipe Costa
Visual Optics – Gualtar	Line 1	Sandra Maria Braga Franco
Optoelectronics – Azurem	Line 3	Carlos Tavares
Photoconductivity – Gualtar	Line 2	Fátima Cerqueira
Photophysics I – Gualtar	Line 2	Elisabete Coutinho
Photophysics II – Gualtar	Line 2	Elisabete Coutinho
Preparation – Azurém	Line 3	Sandra Carvalho
Preparation I – Gualtar	Line 2	Elisabete Coutinho
Preparation II – Gualtar	Line 3	Maria de Jesus Gomes
Raman Spectroscopy and Photothermal Measurements – Gualtar	Line 3	Cacilda Moura / Francisco Macedo

Research in Clinical and Experimental Optometry – Gualtar	Line 1	Jorge Jorge/ José Manuel Meijome
Science of Vision and Colour – Gualtar	Line 1	Sérgio Miguel Cardoso Nascimento
Surface analysis – Azurem	Line 3	Filipe Vaz
Thin Films I – Gualtar	Line 3	Maria Jesus M. Gomes
Thin Films II – Gualtar	Line 3	Mário Pereira
Visual Rehabilitation – Gualtar	Line 1	António Baptista

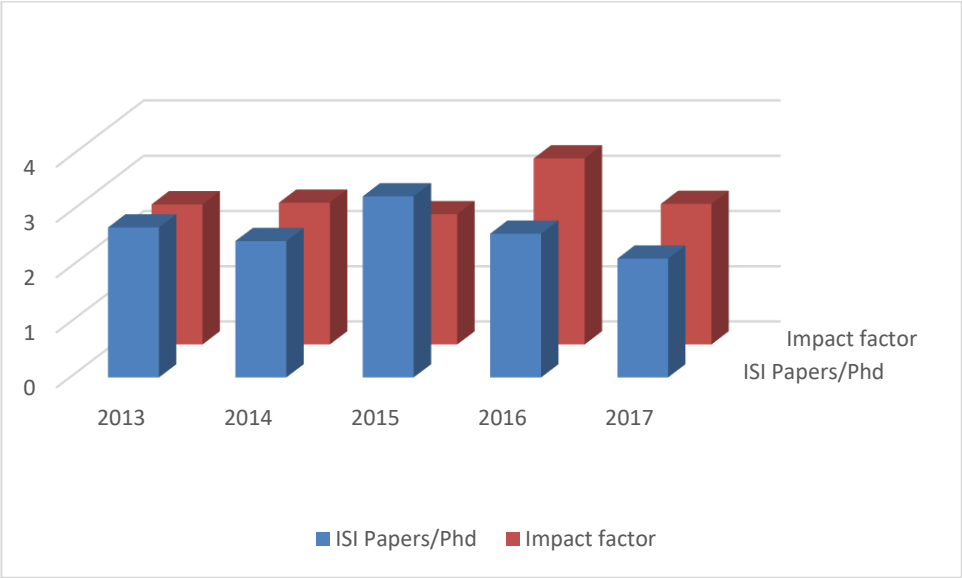
5. Indicators of the Centre Performance

5.1 Publications

Publications	**Number**
ISI papers (regular journal articles/ conference journal articles)	104/9
Books (Edited)	3
Book chapters	12
Patents (national /international)	3/0
Oral Presentations in Internationa Conferences (total/by invitation)	123/51



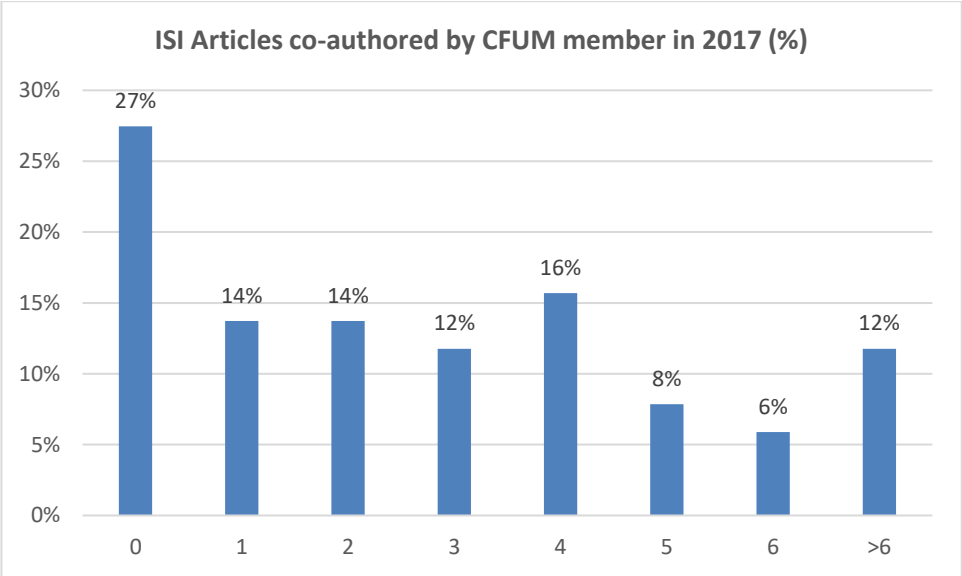
Graph 2: Scientific production, number of members, and number of funded projects



Graph 3: Number os Articles published (per effective member with PhD) and average impact factor os journals where the articles were published

Box 1: Global data on Centre's publications and citations from ISI Web database

Sourse:Http://apps.webofknowledge.com/summary.do?locale=en_US&errorKey=&viewType=summary&product=WOS&search_mode=CitationReport&colName=WOS&page=1&qid=2&SID=E49arKxZDMvSUIHdxHo



Graph 4: Number of ISI articles co-authored by a PhD member in 2017; statistical frequencies

5.2 Seminars and Colloquia organized by the Centre

Seminars

Christopher Muratore, University of Dayton, Ohio, USA
''In-situ measurements of adaptive tribological coatings''.
July 20th, Auditorium EC1:01 School of Sciences, Campus de Azurem

Filipe Correia, Universidade do Minho, Braga
''Transparent films for trasnparent thermoelectric modules. by magnetron sputterin''.
October 11th, Auditorium EC 1.03 School of Sciences, Campus de Azurem

Ahmad Telfah, Leibniz-Institut für Analytische Wissenschaften, Alemanha
"Real time detection of mass and volume limited of 3-D cancer cultures using planar wave-guide Nuclear Magnetic Resonance (NMR) detection".
October 25th, Physics Auditorium, Campus de Gualtar

Prof. Valentin Craqcium, National Institute for Lasers, "Plasma and Radiation Physics, Magurele, Romania Pulsed laser".
November 14th, Auditorium EC1.01, Campus de Azurem

Colloquia

Armando Pinto, Universidade de Aveiro
''A Universal Quantum Layer''
February 8th, School of Sciences Auditorium, Campus de Azurem

José Meijome, Universidade do Minho, Braga
''Physical Origin and Perceptual Aspects of Light Disturbances''
May 30th, Chemistry Auditorium, School of Sciences, Campus de Gualtar

Carlos A. R. Herdeiro, Departamento de Física da Universidade de Aveiro
''Ondas Gravitacionais: um prémio Nobel, 100 anos depois''
November 22nd, School of Sciences Auditorium, Campus de Gualtar

Nuno Castro, Investigador LIP Minho e professor convidado do Departamento de Física
''Fissão e fusão nucleares: das bombas à energia quase gratuita"
December 6th, School of Sciences Auditorium, Campus de Gualtar

Scientific Conferences organized in the University of Minho by members of the Centre of Physics

14-th International Congress of Optometry and Vision Sciences. Universidade do Minho; Braga / Universidade do Minho, April 22-23, 2017 (International)

14-th International Conference on Hands-on Science, Manuel Filipe Costa – Chairperson, HSCI2017, Braga, Portugal, July 10 - 14, 2017. (International)

NANAX8: 8-th International Conference on Nanoscience with Nanocrystals, Mikhail Vasilevskiy (Co-chairman), M. Fátima Cerqueira, Manuel Filipe Costa and Paulo J. G. Coutinho– Members of the Organising Committee,– Braga, Portugal, 3-7 July 2017 (ca 160 participants). (International)

12ª JORNADA TÉCNICO-CIENTÍFICA DE CONTACTOLOGIA (CONTACTUM2017) Universidade do Minho. Braga (Portugal), February 21st, 2017 (National)

Awards, prizes, membership in editorial boards of international journals and other forms of recognition by the community

Solar Activated Release of IR3535 from TiO2-functionalized Microcapsules, J. Marques, M. Forte, T. Gomes, M. Calheiros, C. Gonçalves, C. J. Tavares, 21st International Symposium on Microencapsulation, September 27-29 2017, Faro, Portugal. (Best Poster Award)

2º prémio concurso Ilídio Pinho. (Apoio cientifico a alunos da escola D. Maria II com o projeto: "Energy harvesting with magnetoelectric materials") Lanceros-Mendez, S.

Approaches for enhanced photocatalytic activity: improving photocatalytic efficiency, immobilization and reusability" at "European Materials Research Society (EMRS) 2017", 22-26 May 2017, Strasburg (France) Pedro Manuel de Abreu Martins, Best poster award,

Plasmonic behaviour of noble nanoparticles (Au, Ag) dispersed in AlN, R. P. Domingues, J. Borges, M. S. Rodrigues, F. J. Oliveira, R. F. Silva, E. Alves, N. P. Barradas, and F. Vaz, Materiais 2017, Portugal – Poster awarded with the 3rd place in Poster Presentation.

Electromagnetic properties of a monolayer of polarisable particles deposited on graphene" André Souto, Rui M. Pereira, Jaime E. Santos, N. M. R. Peres and M. I. Vasilevskiy, III Int. Conf. on Applications of Optics and Photonics (AOP2017), Faro, Portugal, May 8-12, 2017 (Oral, presented by .André Souto). SPIE Best Student Paper Award for oral presentation.

Participation in Journal Editorial Boards

- Nuno Peres
- Co-Editor of EuroPhysics Letters

- José Meijome
- Journal of Optometry - Editor-in-Chief
- Biomedical Research International - Editorial Board
- PlosONE - Academic Editor

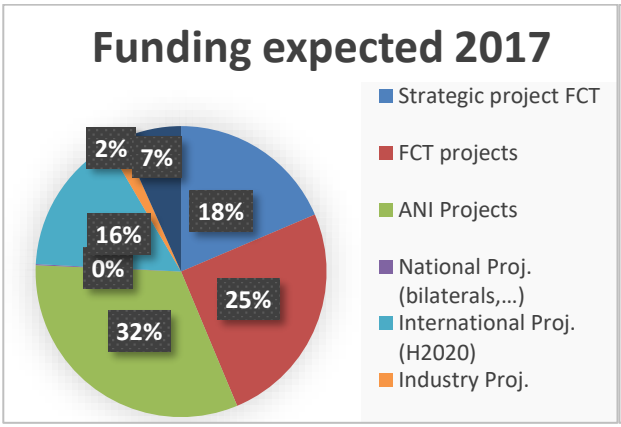
5.3 PhD and MSc degree leading projects at the Centre

MASTERS THESES	COMPLETED	46
PH.D. THESES (PERFORMED AT CFUM / (CO-) SUPERVISED BY A CFUM MEMBER)	ONGOING	40 / 58
	COMPLETED	7 / 16

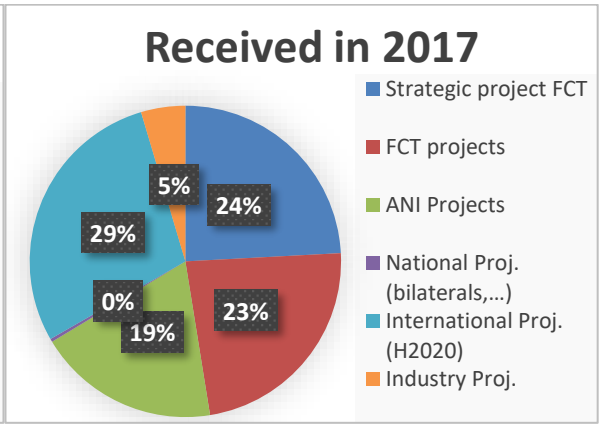
5.4 Funding

5.4.1. Summary

	Global Funding UM	Expected in 2017	%	Received in 2017	%	Expenses paid in 2017	Nº of ongoing projects
Strategic Project (FCT)	299 615,00 €	510 000.00 €	18,59%	147 649,42 €	24%	219 899,20 €	1
FCT Projects	404 705,24 €	1 052 260,00 €	25,11%	142 453,26 €	23%	218 523,16 €	13
ANI Projects	515 773,75 €	647 813,25 €	32,00%	115 556,51 €	19%	71 738,38 €	5
Bilateral Projects	2 000,00 €	4 000,00 €	0,12%	2 000,00 €	0%	1 847,13 €	1
International Proj. (H2020)	253 845,24 €	761 535,72 €	15,75%	175 495,75 €	29%	90 483,61 €	4
Industry funded Proj.	28 085,45 €	28 085,45 €	1,74%	28 085,45 €	5%	34 697,91 €	2
Doctoral Program (Norte 2020)	107 750,00 €	317 250.00 €	6,69%	0 €	0%	45 545 €	1
Total	**1 611 774,68 €**	**2 493 694,42 €**	**100%**	**611 240,39 €**	**1**	**682 734,19 €**	**27**



Graph 5: Funding Expected in 2017

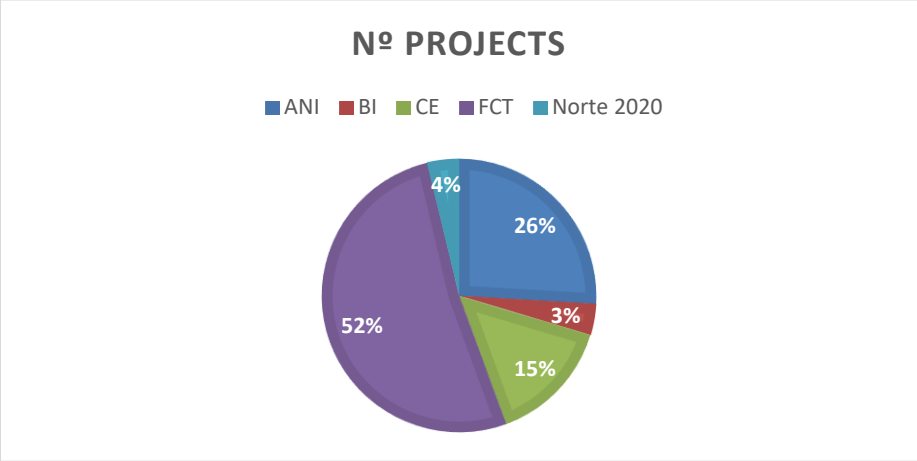


Graph 6: Funding received in 2017

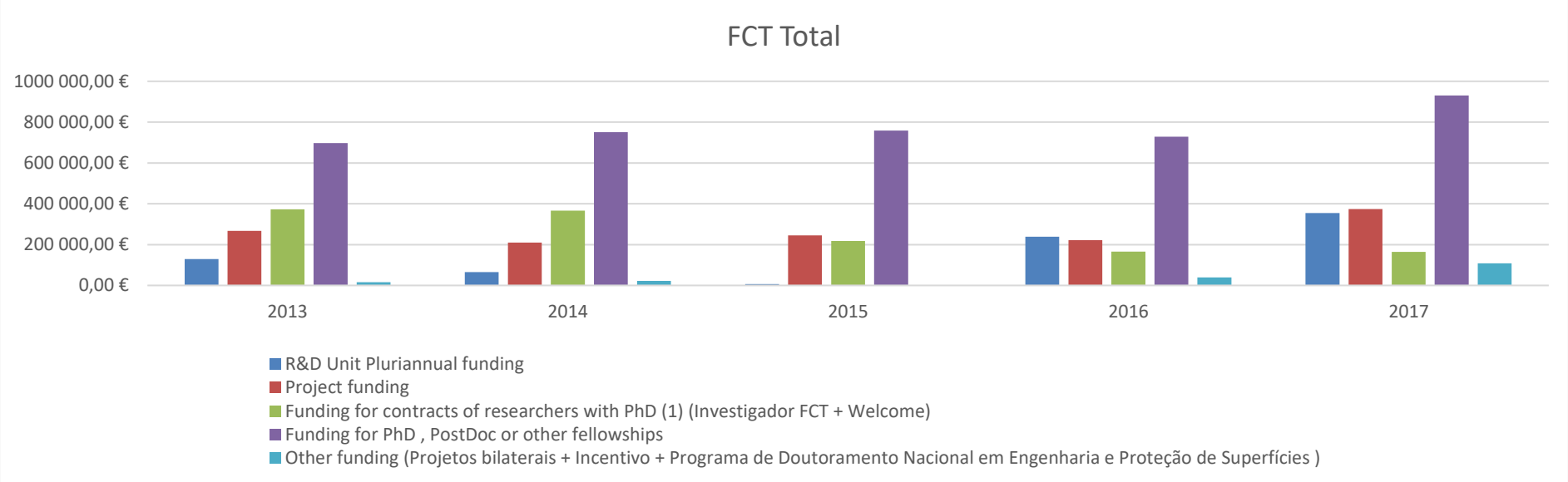
5.4.2 individual projects ongoing

Title	Researcher	Funding entity	Start date	End date	Global Budget - UM
WinPSC - Novos avanços tecnológicos para a terceira geração de células solares sensibilizadas com perovskita	Carlos Tavares	ANI	01-01-2017	31-12-2019	193 150,03 €
ReleaseME - Micro ou nanocápsulas com propriedades fotocatalíticas para libertação controlada de agentes difusores e respetivo método de obtenção	Carlos Tavares	ANI	01-10-2016	30-09-2019	55 859,37 €
NANOTHERAPEUTICS: DEVELOPMENT OF BIONANOSYSTEMS FOR DRUG DELIVERY	Marlene Lúcio	FCT	02-09-2013	01-09-2018	50 000,00
DNTOSIETAA -Design of New Tetrahedral-Octahedral Silicates via Ion Exchange - Towards Advanced Applications	Stanislav Ferdov	FCT	01-01-2015	31-12-2018	50 000,00
SUPROCOAT - Super Protective Coatings (SUPROCOAT): MAX/Lubricant nanocomposite coatings deposited at low temperature by magnetron sputtering	Diego Martinez	FCT	01-01-2015	30-06-2019	50 000,00
NANOSAFELEATHER - The effect on human health of Ag/TiO2NM-treated leathers for footwear industry	Sandra Carvalho	FCT	01-01-2015	31-12-2018	125 364,00
THELINK - European Training Network to Accelerate the Development Chain of Nanostructured Polymers	Marta Ramos	CE	01-11-2014	31-10-2018	443 016,72
Voyage - Opportunities for the young and graduates employability in Vietnam	Filipe Costa	CE	15-10-2015	14-10-2018	40 306,00 €
PLASCOAT - Metalização inovadora e ecológica de plásticos por PVD e CVD assistido por plasma	Filipe Vaz	ANI	01-01-2016	31-12-2018	236 436,89 €
GrapheneCore1 - Graphene-based revolutions in ICT and beyond	Nuno Peres	CE	01-03-2016	28-03-2019	251 988,00 €
Sunshine - Sistema de sensores e estimulo para aplicações biomédicas capazes de detetar a resposta muscular utilizando nano eletrodos - Sunshine	Filipe Vaz	BI	01-01-2016	31-12-2017	4 000,00 €
EyElectro - OPTICAL CUSTOMIZATION OF ELECTRIPHYSIOLOGICAL RETINAL ACTIVITY IN HUMANS	José Manuel Meijome	FCT	01-06-2016	01-06-2019	185 546,00 €
LA2D - Large area two dimensional heterostructures for photodetectors	Ricardo Ribeiro	FCT	01-07-2016	01-07-2019	58 380,00 €
ABSOLAR - Solar selective absorber for high temperature applications	Luís Rebouta	FCT	01-07-2016	30-06-2018	83 748,00 €

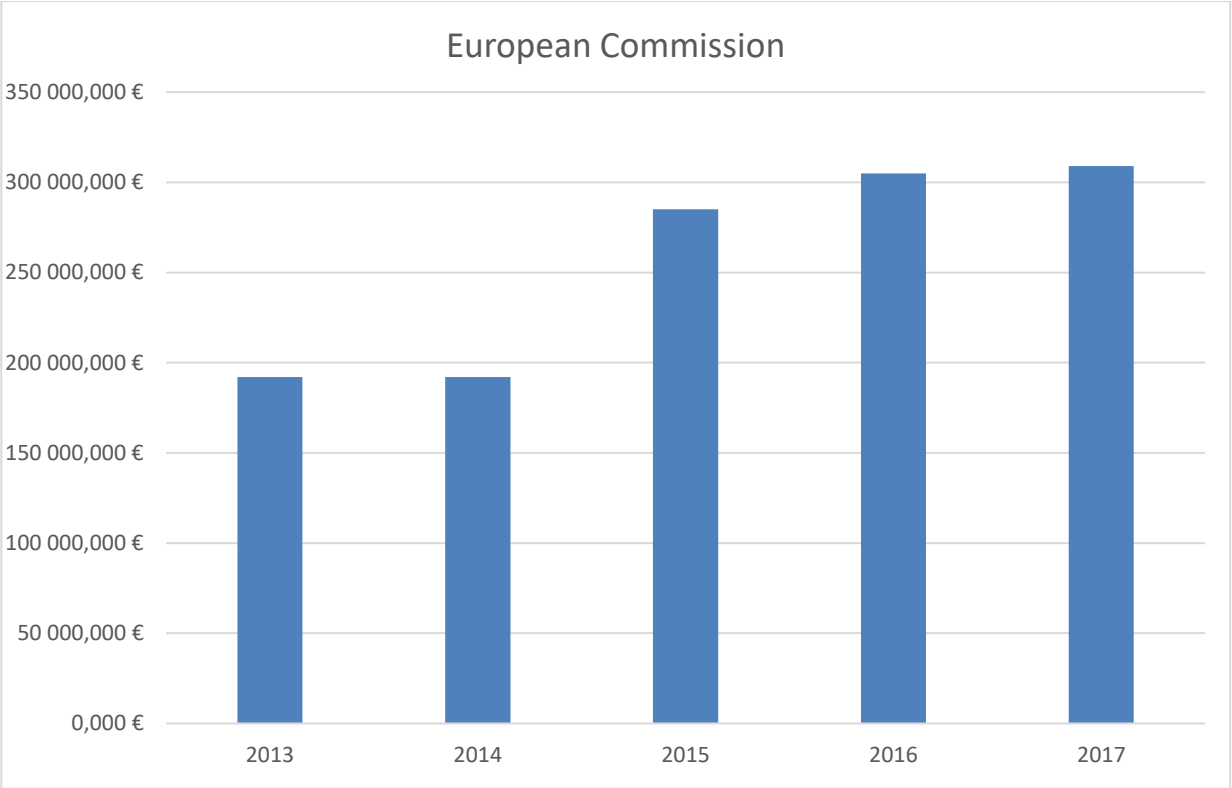
ClusterStent - Clusters bimetálicos para ação antimicrobiana controlada em stents	Sandra Carvalho	FCT	01-07-2016	01-07-2019	100 895,00 €
NANOSENSING - Filmes finos semicondutores do tipo nanocompósito, compostos por nanopartículas de metal nobre dispersos em matrizes reativas óxido-metal para aplicações em detetores de gases com base em ressonância	Filipe Vaz	FCT	01-07-2016	30-06-2019	85 584,00 €
HIT-RIB - Development of heterojunction silicon ribbon solar cells	Fátima Cerqueira/Pedro Alpuim	FCT	01-07-2016	30-06-2019	58 815,00 €
NANOCONCOR - New nanocontainers with extended functionality based on layered double hydroxides for application in corrosion protection	Luís Vieira	FCT	01-05-2016	30-04-2019	20 400,00 €
PrintPV - Large-scale printing of novel photovoltaics based on Cu (In, Ga) Se2 chalcoprite	Senen Lanceros Mendez	FCT	01-06-2016	31-05-2019	78 528,00 €
SAM - Otimização do desempenho térmico da moldação por injeção	Filipe Vaz	ANI	01-10-2016	30-09-2019	157 062,56 €
Centro de Física das Universidades do Minho e do Porto	Mihail Vasilevskiy	FCT	01-01-2015	01-12-2016	510 000,00 €
SURFPROTEC - Programa de Doutoramento Nacional em Engenharia e Proteção de Superfícies	Sandra Carvalho	Norte 2020	01-09-2015	31-08-2019	317 250,00 €
DermoID - Interhiegine	Carlos Tavares	ANI	01-12-2016	30-11-2019	61 163,77 €
TEXSTRA - TEXTILE STRATEGY FOR INNOVATIVE HIGHER EDUCATION	Sandra Carvalho	CE	01-09-2017	29-02-2020	26 225,00 €
ON-SURF	Sandra Carvalho/Filipe Vaz	ANI	01-10-2017	30-09-2020	478 235,35 €
ALD4MAX - Atomic Layer Deposition For tailored bottom-top growth of MAX and MXene films	Diego Martinez	FCT	01-09-2017	31-08-2020	105 000,00 €
NANOPURIFY .: Desenvolvimento de filtros fotocatalíticos em unidades industriais de tratamento de ar",	Carlos Tavares	ANI	01-11-2017	31-10-2020	340 299,79 €



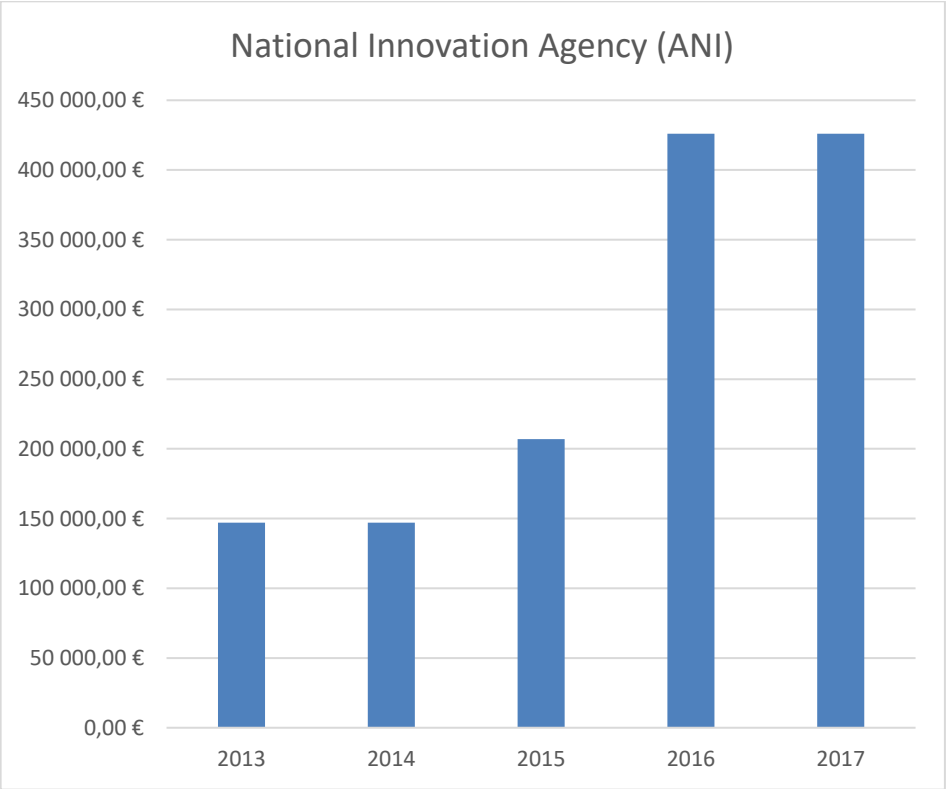
Graph 7: Nº of projects by funding entity



Graph 8: Funding Evolution 2013-2107 (FCT projects



Graph. 9: Funding evolution in 2013-2107 (European projects)



Graph. 10: Funding evolution in 2013-2107 (ANI projects)

5.5 Scientific Production Indicators by line in 2017

	Line 1	Line 2	Line 3	TOTAL
Nº Effective Members with Ph.D.	9	16	18	43
Colaborators with PhD – staff members	4	5	5	14
Colaborators with PhD - Post-Docs (contracts in course at 31/12/2016)	2	3	16	21
Book (Edited)	0	0	3	3
Book Chapters	1	2	9	12
Regular articles published in ISI Journals	17	24	63	104
Average Impact factor	1.796	3.845	3.400	3.014
Conference Proceedings (ISI)	2	4	3	9
Invited Talks in Scientific Conferences (International/National)	11/1	9/2	26/2	46/5
PhD Theses concluded	2	3	11	16
PhD Theses in progress	7	11	23	41
Externally funded R&D projects (National sourses, FCT, ADI)*	1	4	13	18
Externally funded R&D projects (International sources, H2020)	0	1	3	4
Bilateral Cooperation Projects	0	0	1	1
Collaboration Projects with Industry	0	0	2	2
Patents (national/international)	0/0	1/0	2/0	3/0

*PE not included

6. Description of the Main Activities in 2017 by Research Line

6.1 Assessment and enhancing visual performance

6.1.1. Researchers

Principal investigator	José Meijome
Members	**<u>Effective members of the Centre</u>** - António Baptista - António Macedo - António Queirós Pereira - João Manuel Maciel Linhares - Jorge M. Martins Jorge - José M. González Méijome - Madalena Lira - Sandra M. Braga Franco - Sérgio M. Cardoso Nascimento **<u>Collaborators</u>** <u>Staff members with PhD</u> - Ana Maria Pinho (UM) - Daniela Lopes Ferreira (UM, Invited lecturer 59%) - José Alberto Díaz Rey (UM) - Vasco Almeida (UBI) <u>Post-Doctorate Researchers</u> - Miguel Ribeiro - SFRH/BPD/116351/2016 (100%) - Paulo Fernandes - SFRH/BPD/92365/2013 (100%) <u>Integrated PhD students</u> - Alshaarawi Salem (PhD Program in Optometry and Vision Science) - Ana I. Amorim de Sousa (PhD Program in Optometry and Vision Science, FCT Project) - Laura Hernández Moreno (PhD Program in Optometry and Vision Science) - Lina Rodríguez Cely (PhD Program in Optometry and Vision Science) - Pedro Lima - Science Phd Program – FCT Fellowship - Rute J. Macedo de Araújo (PhD Program in Optometry and Vision Science, Industry Project) - Santiago Escandón Garcia - OCV Phd Program <u>PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students</u> - Helena I. Ferreira Neves (PhD in Science, FCT Grant – finished – awaiting presentation) - Maria Francisca Peixoto (PhD Program in Optometry and Vision Science)

	- Serguey Roberto Cusato Junior - OCV Phd Program - Other research students - André Rino Amorim (Research grant holder, FCT Project) - Erna Vukalic (ERASMUS+ student, Velika Gorica University of Applied Sciences, Croatia) - Daliborka Roknic (ERASMUS+ student, Velika Gorica University of Applied Sciences, Croatia) - Masa Klanger (ERASMUS+ student, Velika Gorica University of Applied Sciences, Croatia) - Sofia C. Peixoto de Matos (Invited lecturer 59%)

6.1.1 Brief description of the scientific work carried out within the Research Line in 2017

Assessment and Enhancing Visual Performance Research Line develops competitive research activity in the area of Optics, Optometry and Visual Science. Integrates 8 Senior Researchers, 2 Post-docs, 7 PhD students and 15 to 25 MSc students providing a continuous feedback between research and lecturing in Vision Science at the Bachelor, Master and PhD levels. Areas of expertise is focused in fundamental and applied Vision Research in binocular vision, color science, epidemiology, instrumentation, ocular surface, ocular accommodation, perception, refractive error development, visual electrophysiology, visual optics, visual performance under challenging conditions and visual rehabilitation. Several competitive projects and industry-initiated studies are hosted including international randomized controlled clinical trials. Close interaction with other national and international departments, schools, research centers and a strong link to industry provide the context to develop multidisciplinary and applied research activity. Line members integrate international scientific societies and hold editor responsibilities in leading peer-review journals.

During 2017 the research line members have been involved in research activities related with projects in the field of contact lenses, myopia control, instrumentation, visual performance assessment, visual neuroscience and perception. Members have been involved in the organization of national and international conferences and have presented at several renowned national and international conferences in the field, including several invited lectures. It is to be highlighted also the intense activity of some members in supervision of PhD and MSc students.

Overall, the publication rate in ISI WoS journals has dropped compared to the previous years. The number of funded research projects is at its minimum of the last 10 years reflecting the increasing difficulties in attracting funding over the past 5 years. Additionally, there have bene delays in existing project starting and material acquisition in one funded project from the 2014 FCT call. Two former members of the research line have not kept their condition due to low productivity output and one active member has moved to another European institution, thus lowering its dedication to the research activity at UMinho. Research initiatives linked to industry have allowed the research line members to keep the research activity.

During 2017, several research line members have been starting to explore new areas of research in the field of visual electrophysiology focused on retinal processing of visual signals and functional resonance magnetic imaging related with visual perception. There are already some projects secured to pursue these initiatives. Additional, line members have been involved in several funding applications that we expect to allow to boost again their activity.

The Colour Science Lab have been studying human the vision of daltonics colour vision properties at a fundamental, structural and perceptual level. It covers the human colour vision deficiencies and normal colour vision over four fundamental areas of research. The structural and spectral characterization of the retinal cone mosaic uses adaptative optics to perform retinal imaging to achieve a higher detail of observation of the retinal cone mosaic. The colour vision deficiencies is assessed and interpreted using psychophysics, spectral analysis and modeling of the abnormal colour vision aiming at providing further knowledge at the understanding of the modeling and to provide visual tools that improves the overall colour vision of colour vision deficient observers. Using spectral imaging and lighting information, fundamental properties of complex imaging observation are studied on natural scenes and artistic paintings. The main goals are the characterization of the colour of paintings and their relation to human aesthetics and to characterize the visual effects of lighting in nature and in human environments.
These works at the Colour Science Lab are achieved over a network of collaborations from Italy, to Germany, to the United Kingdom, to Japan, to Spain, to Portugal and to Norway.

6.1.2 Future research summary

The future development of the research activity will be focused on the expertise areas: binocular vision, color science, epidemiology, instrumentation, ocular surface, ocular accommodation, perception, refractive error development, visual electrophysiology, visual optics, visual performance under challenging conditions and visual rehabilitation.
The short-term activity will be focused on the preparation of Physics Research Center FCT evaluation and the definition of the research project to be developed in this context over the next 5 years (2018-2022). This project will integrate the expertise of the group in the fields of Fundamental Research in neuroscience, Applied Technologies in visual optics, optical modelization and instrumentation, and the Applied Clinical Research in ocular surface and contact lenses, low vision and rehabilitation, binocular vision and accommodation.
The present framework of research funding at the national and European level is very promising and the line members should take advantage of these opportunities to strength the human resources of the group and update and reinforce the research facilities. This will be also an opportunity to recruit granted PhD students in the PhD Program in Optometry and Vision Science.
Therefore, the activity of the research line will be focused on the following 5 pillars:
- Conduct fundamental research coupling knowledge of visual optics with the electrophysiological assessment of the visual information customized through minimally invasive optical devices in our areas of expertise.
- Consolidate and attract funding to develop the new research topics under development and interlink these with applications in the existing areas of expertise of ocular surface, color vision, visual optics and instrumentation.
- Attract internationally funded projects from public and private initiatives, with particular relevance for the participation and leadership of international consortiums to participate in European projects (COST, FET, ERC, etc).

- Recruit PhD students in the context of the PhD Program in Optometry and Vision Science and post-doc researchers.
- Keep the publication track increasing progressively the impact of the articles published and our participation in international scientific meetings.
Conduct fundamental research on colour vision, colour vision deficiencies and visual effects of lighting on natural scenes and art paintings and its influence on visual aesthetics, using hyperspectral imaging and adaptative optics techniques.

6.1.3 Publications

6.1.3.1 Regular articles published in ISI/Scopus Journals

Assessment of multispectral and hyperspectral imaging systems for digitisation of a Russian icon. MacDonald, L. W., Vitorino, T., Picollo, M., Pillay, R., Obarzanowski, M., Sobczyk, J., Nascimento, S., Linhares, J. (2017). Heritage Science, 5(1), 41. https://doi.org/10.1186/s40494-017-0154-1

Combined Effect of Ocular and Multifocal Contact Lens Induced Aberrations on Visual Performance: Center-distance vs Center-near Design. Lopes-Ferreira D, Fernandes PRB, Queirós A, González-Méijome JM. Eye & Contact Lens. 2017 Jan 4. doi: 10.1097/ICL.0000000000000355

Comfort, ocular dryness and equilibrium water content changes of daily disposable contact lenses. Eduardo Insua-Pereira, Madalena Lira. Eye & Contact Lens, article in press. doi: 10.1097/ICL.0000000000000441 http://hdl.handle.net/1822/48575

Daily versus monthly disposable contact lens: which is better for ocular surface physiology and comfort? Sapkota K, Franco S, Lira M. Contact Lens Anterior Eye, article in press. Doi. 10.1016/j.clae.2017.12.005. http://hdl.handle.net/1822/48561

Effect of Lens Care Systems on Silicone- Hydrogel Contact Lenses Hydrophobicity. Madalena Lira, Rita Silva. Eye & Contact Lens, 43(2) (2017) 89-94; doi: 10.1097/ICL.0000000000000247 http://hdl.handle.net/1822/43917

Ocular Response to Environmental Variations in Contact Lens Wearers. López-de la Rosa A, Martín-Montañez V, López-Miguel A, Fernández I, Calonge M, González-Méijome JM, González-García MJ. Ophthalmic Physiol Opt. 2017;37:60-70.

On-eye breakage and recovery of mini-scleral contact lens without compromise for the ocular surface. Macedo-de-Araújo RJ, van-der-Worp E, González-Méijome JM. Contact Lens Anterior Eye. 2017 (in press)

Predicted accommodative response from image quality in young eyes fitted with different dual-focus designs. Faria-Ribeiro M, Amorim-de-Sousa AI, González-Méijome JM. Ophthalmic Physiol Opt. (in press)

Robust colour constancy in red-green dichromats. Álvaro, L., Linhares, J. M. M., Moreira, H., Lillo, J., & Nascimento, S. M. C. (2017). PLOS ONE, 12(6), e0180310. https://doi.org/10.1371/journal.pone.0180310

Supporting history of art with colorimetry: The paintings of Amadeo de Souza-Cardoso. Montagner, C., Linhares, J. M. M., Vilarigues, M., Melo, M. J., & Nascimento, S. M. C. (2017). Color Research & Application, (June), 1–7. https://doi.org/10.1002/col.22189

The colors of paintings and viewers' preferences. Nascimento, S. M. C., Linhares, J. M. M., Montagner, C., João, C. A. R., Amano, K., Alfaro, C., & Bailão, A. (2017). Vision Research, 130, 76–84. https://doi.org/10.1016/j.visres.2016.11.006

Through-focus vision performance and light disturbances of 3 new intraocular lenses for presbyopia correction. Escandón-García S, Ribeiro F, McAlinden C, Queiros A, González-Méijome JM. J Ophthalmol. (in press)

Vision in high-level football officials, António Baptista, Pedro Serra, Colm McAlinden, Brendan Barrett, PLoS One, 12 (2017), e0188463; http://hdl.handle.net/1822/47691

Visual and health outcomes, measured with the activity inventory and the EQ-5D, in visual impairment, Filipe Macedo, Pedro Ramos, Laura Hernandez-Moreno, Joana Cima, António Baptista, Ana Marques, Robert Massof, Rui Santana, Acta Ophthalmol, 95(8) (2017), e783-e791; doi: 10.1111/aos.13430

Using endogenous saccades to characterize fatigue in multiple sclerosis M Ferreira, PA Pereira, M Parreira, I Sousa, J Figueiredo, JJ Cerqueira, AF Macedo Multiple Sclerosis and Related Disorders 14, 16-22

The Effect of Religious Clothing on Gaze Behavior: An Eye-Tracking Experiment F Pazhoohi, AF Macedo, J Arantes Basic and Applied Social Psychology 39 (3), 176-182

Arching the Back (Lumbar Curvature) as a Female Sexual Proceptivity Signal: an Eye-Tracking Study F Pazhoohi, JF Doyle, AF Macedo, J Arantes Evolutionary Psychological Science, 1-8

6.1.3.2 Books and book chapters
Chapter

A Study of Spectral Imaging Acquisition And Processing For Cultural Heritage", Sony George, Jon Y. Hardeberg, João Linhares, Lindsay Macdonald, Cristina Montagner, Sérgio Nascimento, Marcello Picollo, Ruven Pillay, Tatiana Vitorino, And E. Keats Webb, in "Digital Techniques for Documenting and Preserving Cultural Heritage" in Chapter 8, Anna Bentkowska-Kafel and Lindsay Macdonald (Editors), Arc Humanities Press, Kalamazoo and Bradford. 2017. ISBN: 9781942401346.

6.1.3.3 Conference Proceedings with Pier Review appearing in the ISI Database

An exploratory study of temporal integration in the peripheral retina of myopes, Antonio F. Macedo, Tito J. Encarnação, Daniel Vilarinho, António M. G. Baptista, Proc. SPIE v. 10453 (2017), 104532G; doi: 10.1117/12.2276237 http://dx.doi.org/10.1117/12.2276237

Assessing the wavefront aberrations of the emmetropic eye after a reading task, Sandra Franco, Cristina M Oliveira Proc. SPIE 10453, Third International Conference on Applications of Optics and Photonics, 104532D (2017) doi:10.1117/12.2276055; http://hdl.handle.net/1822/47618

6.1.4 Conference Presentations

6.1.4.1 Invited talks delivered at Conferences (International/National) International

Lentes de contacto esclerales y semiesclerales. Bausch + Lomb Boston Material Webinar. (Invited e-lecture) González-Méijome JM. February 6th, 2017 (Uruguay, Brasil, Argentina, Colombia, Mexico). (International)

Biomateriales y confort. III Simposio Internacional Biomateriales y Superficie Ocular: Lentes de Contacto Ciencia, Clínica y Tecnología: El futuro de la Contactología.(Invited Lecture) González-Méijome JM. Xativa, Valencia, Spain – March 31st to April 2nd, 2017. (International)

Control de miopia con lentes de contacto. III Simposio Internacional Biomateriales y Superficie Ocular: Lentes de Contacto Ciencia, Clínica y Tecnología: El futuro de la Contactología. (Invited Lecture) González-Méijome JM. Xativa, Valencia, Spain – March 31st to April 2nd, 2017. (International)

Adaptación de lentes de contacto RPG con recurso a topografia corneal. González-Méijome JM. (Invited Lecture) OPTOM & European Academy of Optometry and Optics. Barcelona, May 12th to 14th, 2017. (International)

Adaptación de lentes de contacto RPG con recurso a topografia corneal. Bausch + Lomb Boston Material Webinar.(Invited e-lecture) González-Méijome JM. February 6th, 2017 (Uruguay, Brasil, Argentina, Colombia, Mexico). (International)

Multifocal Contact Lenses: new designs and materials. Congresso Internacional de Optometria e Ciências da Visão (CIOCV2017). (Invited Lecture) González-Méijome JM. Universidade do Minho, Braga, Portugal. April 22-23, 2017 (International)

SPECSAVERS Clinical Conference. Daily disposable and contact lens material science.(Invited Speaker) González-Méijome JM. Utrech (NL), Oslo (NO), Stockolm (SE), Odense (DK), Helsinky (FI). 8th-12th October 2017. (International)

Myopia control with contact lenses. Sociedad Gallega de Optometria Clínica. (Invited Lecture) González-Méijome JM. Santiago de Compostela, Spain. May 27, 2017. (International)

Dynamic and real-time study of the human lens optical and morphological properties during accommodation: preliminary results. (Invited Lecture) Sandra Franco, Third International Conference on Applications of Optics and Photonics, Faro, Portugal 2017 (International)

Caso Clínico de Visão Binocular e Terapia Visual. 14º International Congress of Optometry and Vision Sciences. (Invited Lecture) Sandra Franco. Universidade do Minho; Braga / Universidade do Minho, April 22-23, 2017 (International)

Síndrome Visual do Computador. 14º International Congress of Optometry and Vision Sciences. (Invited Lecture) Sandra Franco. Universidade do Minho; Braga / Universidade do Minho, April 22-23, 2017 (International)

National

Como funciona a retina? / How retina works?. (Invited Speaker) Ana Amorim de Sousa, José M. González-Méijome.Optomevista 2017. Organized by Studens of Optometry Universidade do Minho (NEOUM), Braga, Portugal. April 8th, 2017 (National)

6.1.4.2 Contributed talks delivered at Conferences (International/National)

International

Preferential looking for visual acuity assessment: A human-operator independent approach, Paulo Fiadeiro, João Alves, André Machado, António Baptista, Pedro Serra, AOP2017,Faro,2017 (Internacional)

Pupil Near Reflex in Pseudophakes Implanted with Monofocal Intraocular Lenses, Renato Gomes, Paulo Fiadeiro, Trancón Sánchez, Elsa Fonseca, António Baptista, Pedro Serra, EAOO 2017,Barcelona,2017 (Internacional)

An exploratory study of temporal integration in the peripheral retina of myopes António Baptista, Tito Encarnação, Daniel Vilarinho, António Macedo, III International Conference on Applications of Optics and Photonics,Faro,2017 (Internacional)

Visual Acuity measured with vanishing optotypes as function of presentation duration, André Machado, Pedro Serra, António Baptista, Elsa Fonseca, Paulo Fiadeiro, EAOO 2017, Barcelona,2017 (Internacional)

Dysphotopsia in RLE surgery: pre- and post evaluation of light disturbances. Congresso Internacional de Optometria e Ciências da Visão (CIOCV2017). Universidade do Minho, Braga, Portugal. April 22-23, 2017 (Internacional)(Oral Freen Paper) Escandón-García S, Ribeiro F, González-Méijome JM.

3-year effectiveness of a Dual-Focus 1 Day Soft Contact Lens for Myopia Control. Chamberlain P, Back A, Lazon P, Jones D, Logan N, González-Meijome JM, Saw SM, Young G. British Contact Lens Association (BCLA) Clinical Conference Liverpool (UK), June 9-11, 2017. (Internacional)(Oral Free Paper)

Retinal Image Quality with Different Dual Focus Designs for Myopia Control. Peixoto-de-Matos SC; Amorim-de-Sousa A; González-Méijome JM. International Myopia Conference (IMC). Birmingham (UK), September 14-17th, 2017. (Internacional)(Free Paper) Faria-Ribeiro M, González-Méijome JM.

Myopia control with a Dual-Focus Daily Disposable Soft Contact Lens: 2-Year Results from a Multicenter Randomised. Congresso Internacional de Optometria e Ciências da Visão (CIOCV2017). Universidade do Minho, Braga, Portugal. April 22-23, 2017 (Internacional)(Oral Freen Paper) González-Méijome JM, Back A, Chamberlain P, Logan N, Jones D, Saw SM.

Light Disturbance in Presbyopia With Multifocal CL and Monovision. Fernandes P, Escandón-Garcia S, Amorim-de-Sousa A, González-Méijome JM. European Academy of Optometry and Optics. Barcelona, May 12th to 14th, 2017. (Internacional)(Oral Free Paper)

Assessment of the Anterior Scleral Shape in Healthy and Irregular Corneas and After Scleral Contact Lens Wear. Macedo-de-Araújo RJ, van der Worp E, González-Méijome JM. European Academy of Optometry and Optics. Barcelona, May 12th to 14th, 2017. (Internacional)(Oral Free Paper)

Dysphotopsias before and after implantation of multifocal IOLs in clear lens presbyopic patients. Escandón-García S, Ribeiro F, González-Méijome JM. European Academy of Optometry and Optics. Barcelona, May 12th to 14th, 2017. (Internacional)(Oral Free Paper)

Changes in the optical properties of the eye with the use of computers. Third International Conference on Applications of Optics and Photonics, Faro, Portuga 2017. (Internacional)Sandra Franco, Andreia Gonçalves,

National

O olho em ação: da perceção ao treino de decisão - Perceção Visual-, António Baptista, Colóquios de Optometria da UBI, Covilhã,2017

6.1.4.3 Conference organization (International/National)

International

1st International Colour Vision Society (ICVS) Summer School. Pembroke College, Oxford, Oxford University. 4-8 July, 2017 (Colour Vision Research Line). (Internacional)

III International Conference on Applications of Optics and Photonics,2017, Universidade do Algarve, Faro (Portugal), May 8-12, 2017 (Internacional)

14th international conference on Hands-on Science, HSCI2017, Agrupamento de Escolas André Soares, Braga, Portugal, July 10- 14, 2017. (Internacional)

6.1.5 Supervision of Research Students

6.1.5.1 PhD projects completed in 2017

Author	Supervisor	Title	Situation
Santiago Escandón García	José M. González Méijome	Visual performance and adaptation to light disturbances in pseudophakic patients implanted with multifocal intraocular devices for presbyopia correction	PhD OCV – ECUM
Daniela Lopes Ferreira	José M. González Méijome , António Queirós	Effect of Multifocal Contact Lenses in Peripheral Refraction and in Accommodation of Young Subjects	PhD OCV – ECUM

6.1.5.2 PhD projects in progress

Author	Supervisor	Title	Situation
Helena I. Ferreira Neves	José M. González Méijome , António Queirós	Analysis of Light Visual Distortion and Quality of Vision with Different Multifocal Lens Designs for the Compensation of Presbyopia	PhD In Sciences Awaiting presentation
Rute J. Macedo de Araújo (PhD Program in Optometry and Vision Science, Industry Project)	José Manuel González Méijome	Clinical performance and biological interactions in scleral contact lens wear	OCV
Ana I. Amorim de Sousa (PhD Program in Optometry and Vision Science, FCT Project)	José Manuel González Méijome	To define	OCV
Maria Francisca Peixoto (PhD Program in Optometry and Vision Science)	José Manuel González Méijome	To define	OCV
Alshaarawi Salem (PhD Program in Optometry and Vision Science)	António Baptista	To define	OCV
Lina Rodríguez Cely (PhD Program in Optometry and Vision Science)	To define	To define	OCV

Laura Hernández Moreno (PhD Program in Optometry and Vision Science)	Filipe Macedo	To define	OCV
Serguey Roberto Cusato Junior	To define	To define	OCV

6.1.5.3 MSc projects completed in 2017

Author	Supervisor	Title	Situation
Claudia Vieira	António Queirós , José M. González Méijome	Variações da Asfericidade Corneal	ECUM
Francisco Paulo Gomes da Silva	José M. González Méijome	Professional Activity Report*	MOA
Diana Pereira Calheiros Brandão	José M. González Méijome, António Queirós	Caraterização Refrativa, Ocular e Visual dos Novos Estudantes da Universidade do Minho	MOA
Cátia Alexandra Dias Gomes	José M. González Méijome, António Queirós	Hábitos Visão nos Novos Estudantes da Universidade do Minho	MOA
Ana Rita Pinto Valença	Madalena Lira	Professional Activity Report	ECUM
Gustavo Adolfo Coelho Marin	Madalena Lira, Elisabete Coutinho	Variação da Transmitância, Refletância e Índice de Refração das Lentes de Contacto: Influência da Potência e do Material das Lentes.	ECUM
Jéssica Rafaela Moreira Gomes	Sandra Franco, Sérgio Nascimento	Variação das aberrações oculares com a acomodação em tempo real	ECUM

6.2. Plasmonic, luminescent, magnetic and hybrid nanostructures for optoelectronic, biomedical and environmental applications

6.2.1. Researchers

Principal investigator	Paulo José Gomes Coutinho
Members	**<u>Effective members of the Centre</u>** - Anabela Gomes Rolo - Bernardo Gonçalves Almeida - Elisabete Maria dos Santos Castanheira Coutinho - Gaspar Machado (joined in December 2017) - Gueorgui Vitalievitch Smirnov - João Pedro Santos Hall Agorreta Alpuim - Jorge Figueiredo (joined in December 2017) - Luís Manuel Gomes Vieira - Maria de Fátima Guimarães Cerqueira - Maria Elisabete da Cunha Dias Real Oliveira - Mário Rui da Cunha Pereira - Marlene Susana Dionísio Lúcio - Michael Scott Belsley - Mikhail Igorevich Vasilevskiy - Nuno Miguel Machado Reis Peres - Paulo José Gomes Coutinho - Ricardo Pedro Lopes Martins de Mendes Ribeiro - Rui Pereira (joined in December 2017) - Sofia Lopes (joined in December 2017) - Stephane Louis Clain (joined in December 2017) **Collaborators** <u>Staff members with PhD</u> - José Carlos Viana Gomes (Singapore University) - José Luis Ribeiro (UM) - Júlia Maria Simões Dias Barata de Tovar Ayres de Campos (UM) - Maria José Sampaio (UM) - Teresa Maria Santos Ribeiro Viseu (UM) <u>-Post-Doctorate Researchers</u> - Jaime Eduardo Vieira Silva Moutinho Santos Project Uminho/Bosch (UMINHO/BI/214/2016) (50%) - Joel Borges - SFRH/BPD/117010/2016 (85%) -Yuliy Bludov European Project Graphene FPA – 649953 (UMINHO/BPD/20/2016) (100%) <u>Integrated PhD students</u>

- Ana Rita Oliveira Rodrigues (PhD in Physics MAP-Fis; FCT grant SFRH/BD/90949/2012)
- André Chaves (PhD in Sciences, speciality in Physics)
- Balaji Sompalle (PhD in Physics MAP-Fis)
-César Rui Freitas Bernardo (PhD in Physics MAP-Fis; FCT grant SFRH/BD/102616/2014)
- Eliana Tiba Gomes Grande - Science Phd Program
- Filipe André Peixoto Oliveira (PhD in Physics MAP-Fis)
- Hugo Manuel Castro Gonçalves (PhD in Physics MAP-Fis; Grant from MAP-Fis Doctoral Program)
- Ícaro Jael Mendonça Moura (PhD in Physics MAP-Fis, CAPES Grant, Brazil)
- Isabel Cristina Azevedo Machado de Araújo
- Nuno Miguel Teles Oliveira
- Sara Filomena Ribeiro Pimenta - Science Phd Program – FCT Fellowship

<u>PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students</u>
- George Luiz Machado Junior (PhD in Materials Engineering; CNPq GDE(CsF) grant: 237630/2012-5, Brazil)
- Gonçalo Catarina (PhD in Physics MAP-Fis)
-Patrícia Daniela Cabral da Silva (PhD in Physics MAP-Fis, FCT grant SFRH/BD/128579/2017)
- Ramya Gummadi (PhD in Physics MAP-Fis)

<u>Other research students</u>
- Ana Rita Pereira Caldas (MSc student, start Sept. 2017)
- Beatriz Dias Cardoso (MSc student, start Sept. 2016)
- Bruno A. A. Santos (BSc. Licenciatura em Física)
- Carlos Adalberto Brito Magalhães (MSc student, start Sept. 2016)
- Célia de Jesus Sousa Barbosa (MSc student until June 2017)
- Daniela Ferreira Gomes (MSc student, start Sept. 2016)
- Daniela Sofia Marques Pereira (MSc student, start Sept. 2016)
- Diana Isabela Faria Meira (MSc student, start Sept. 2017)
- Diogo Emanuel Carvalho Costa (MSc student until March 2017; PT2020 Fellowship)
- Diogo Manuel Pacheco Teixeira (MSc student until July 2017)
- Eduarda Barbosa Fernandes (MSc student until March 2017)
- Eduardo Dias (fellowship of the Centre of Physics, 2017)
- Fernando Miguel Gonçalves Costa (MSc student until March 2017)
- Gustavo Adolfo Coelho Marín (50%) (MSc student until Sept. 2017)
- Irina Soraia Rainho Rio (MSc student, start Sept. 2017)
- Jacinto João Lemos Freitas (MSc student until July 2017)
- Joana Isabel Oliveira Gomes de Matos (MSc student until Feb. 2017)
- João Marco Carneiro Ferreira (MSc student, start Sept. 2017)
- João Miguel Fernandes Araújo (MSc student, start Sept. 2017)
- João Tiago Costa Silva (MSc student, start Sept. 2017)
- Juliana Filipa Gomes Silva (MSc student until May 2017; CFUM BI fellowship May Nov. 2017)
- Maria João Fernandes Faria (MSc student, start Sept. 2017)
- Maria Lúcia Miranda Gomes (MSc student, start Sept. 2016)
- Maria Manuela Carvalho Proença (MSc student, start Sept. 2016)

	- Maria Margarida de Almeida Cautela (50%) (MSc student until Feb. 2017) - Mariana Isabel C. N. Almeida Monteiro (MSc student, start Oct. 2017) - Marina Alves (MSc student, start Oct. 2017) - Marisol de Gouveia Dias (MSc student, start Sept. 2017) - Micael Moreira Alves (50%) (MSc student, start Oct. 2017) - Nélson Emanuel Salgado Teixeira (MSc student until Nov. 2017) - Patrícia Alexandra Pereira da Silva (MSc student, start Sept. 2017) - Pedro Filipe Cardoso da Silva (MSc student, start Sept. 2017) - Pedro Miguel Coxixo Xarepe (MSc student, start Sept. 2017) - Ricardo Jorge Cunha Fernandes (MSc student, start Oct. 2017) - Rita Falcão Baptista Ribeiro Mendes (MSc student until Oct. 2017) - Rui Pedro Pereira Domingues (PT2020 Fellowship) - Sarah Brito Bogas (MSc student, start Sept. 2017) - Tatiana Vilhena Torres Ventura (MSc student, start Sept. 2016) - Telma Bezerra Soares (MSc student until April 2017) - Tiago Miguel Castro Costa (MSc student until Dec. 2017)

6.2.1. Brief description of the scientific work carried out within the Research Line in 2017

Thin films composed by noble nanoparticles (Au, Ag) dispersed in dielectric matrixes (TiO2, Al2O3, AlN, CuO) were developed, manifesting localized Surface Plasmon Resonances (LSPR), for gas and biosensing applications. The thin films were prepared by magnetron sputtering and post-deposition thermal annealing. An optical sensing system was assembled for testing the thin films in terms of sensitivity in the presence of gas molecules and biological analytes.

Concerning the properties and applications of graphene, the research performed was mostly on the plasmonic properties of graphene. The team conducted a detailed description of channel plasmons in graphene-based V-like wedges and in graphene-based anti-stripes. The formation of plasmonic wakes due to the passage of fast moving charges was also considered.

It was investigated the theory and modelling of surface plasmon-, exciton- and phonon-polaritons in (multi-) layer materials (semiconductors, metals, graphene, monolayers of nanoparticles), with the objectives of (i) materials characterisation, (ii) applications in molecular sensing and (iii) improved optoeletronic devices such as optical misolator or polariton laser.

Graphene immunosensors for ischemic stroke biomarkers detection were fabricated as well as graphene genosensors for DNA detection in Port wines and DNA biomarkers of malaria infectious agents in saliva. Advanced CVD of graphene was performed for high-carrier mobility, and transfer-free processes over large areas. h-BN was also grown by CVD. Photodetectors based on Van der Waals heterostructures of 2D materials are under development.

DFT, GW and Bethe-Salpeter equation calculations on phosphorene and single layer h-BN were carried out.

Lipid based nanocarriers and polymeric based scaffolds were developed for the encapsulation of different drugs (anticancer, antiviral, antidepressive) and bioactives (resveratrol, fish oils), for pharmaceutical, dermocosmetical and nutraceutical applications. Graphene quantum dots were also developed and characterized for cancer theranostics purposes. High throughput screening biophysical methods and model systems were developed for in vitro pharmacokinetic profiling of newly synthesized drugs (collaboration with FCUP) and bioactives after encapsulation in nanocarriers.

The epitaxial growth of strained colossal magnetoresistance thin films on crystalline substrates was investigated. Their detailed structural and microstructural characterizations allowed correlating them with changes in their magnetic properties (phase transitions, critical temperatures). Laser annealing was used on Ca and Zr doped BaTiO3 films on metallic amorphous substrates. The evolution of their structure and dielectric properties with annealing fluencies and time was characterized. The synthesis of new ferroelectric and Ni-ferrite based multiferroic nanofibers by electrospinning was performed.
Magnetic nanoparticles (MNPs) based on several ferrites and combined ferrite/gold were prepared and entrapped or covered with a lipid bilayer, forming magnetoliposomes for applications in dual cancer therapy (by combined chemotherapy and magnetic hyperthermia and/or thermotherapy). A new peptide based hydrogel containing the RGD sequence was evaluated as drug nanocarrier, aiming at targeted therapy. The development of nanostructured magnetogels was started, by entrapping MNPs in biocompatible peptide-based hydrogels (collaboration with CQUM). MNPs were also decorated by plasmonic nanoparticles (Au or Ag) and coupled with suitable amino acids (cysteine, tryptophan) that act as reporters in SERS sensing applications.
Using dip coating and SILAR techniques, metal chalcogenide heterostructures composed of CdS/CdSe and SnS/Cu2S were prepared and assembled as Grätzel type quantum dot sensitized solar cells (QDSSCs). CdTe quantum dots were coupled with BaSnO3 and their photocatalytic properties were evaluated in hydrogen photoproduction with concomitant pollutant photodegradation.
A series of novel chromophores with enhanced nonlinear optical responses was developed and characterized and the potential for use as chromatic chemical sensors was evaluated. Subwavelength polymeric fibers were fabricated via electrospinning and shown to possess a strong second order nonlinear optical response that originates from small organic molecules which normally crystallize in centrosymmetric structures. Ultrafast spectroscopy was carried out to explore the dynamics of quantum dot systems in fractal structures, as well as within the proximity of a variety of 2D materials and metallic films.

6.2.2. Future research summary

The future research will be focused on the plasmonic properties of graphene on metalic gratings. In this case, the formation of acoustic plasmons, with very high wavenumber, occurs. This leads to a strong confinement of the electromagnetic field with potential applications to sensing.
It will be investigated the theory and modelling of (i) new mechanisms of excitation of surface plasmon polaritons in graphene-based structures, and (ii) coupling between excitons confined in quantum dots and elementary excitations in 2D materials.
The projects on biosensing based on graphene electronic devices and on Van der Waals heterostructures of 2D materials will be continued. Using the results of the work on graphene and on h-BN, the development of single photon emitters on demand will be started.
DFT, GW and Bethe-Salpeter equation calculations of defects in single layer h-BN will be performed.
The optimization of LSPR thin films for optical molecular sensing will be continued.
The immobilization of a gold nanoparticle layer on glass substrates will be used for gold thin film production through electroless plating, aiming at SERS sensing applications through the binding of targets previously coupled with plasmonic nanoparticles.
Regarding lipid based nanocarriers, future research will foccus on further developing the pharmaceutical, dermocosmetical and nutraceutical applications and also joining hybrid nanostructures for biomedical applications with other materials and scaffolds for the development of functional materials.

Using laser ablation and electrospinning techniques, low-dimensional (nanofibers, thin films) materials with enhanced ferroelectric and/or magnetic properties will be synthesized with subsequent characterization of their structural, dielectric, magnetic and optical properties.
The optimization of multifunctional magnetic bionanosystems (plasmonic decorated magnetic nanoparticles, magnetoliposomes, magnetogels) will be continued, for applications in synergistic and targeted therapy. The photocatalytic activity of ferrite magnetic nanoparticles will be used in photodegradation of model water pollutants (dyes, chloroaromatic compounds).
The physical origins underlying the strong second harmonic generation of centrosymmetric molecules embedded in sub-micron polymeric structures will be investigated. Ultrafast and nonlinear spectroscopy will be employed to explore the exciton dynamics of quantum dot systems placed within the near-field of metallic surfaces and a variety of 2D materials.

6.2.3. Publications

6.2.3.1. Regular articles published in ISI/Scopus Journals

A hydrodynamic model approach to the formation of plasmonic wakes in graphene, A. J. Chaves, N. M. R. Peres, G. Smirnov, and N. Asger Mortensen, Physical Review B, 96 (2017) 195438; http://hdl.handle.net/1822/47626

Adsorption of H2, O2, H2O, OH and H on monolayer MoS2, Fábio Ferreira, Alexandra Carvalho, Ícaro J. M. Moura, José Coutinho and R. M. Ribeiro, Journal of Physics: Condensed Matter, 30 (2017) 035003; http://hdl.handle.net/1822/48427

Atomic-layer-deposited ultrafine MoS2 nanocrystals on cobalt foam for efficient and stable electrochemical oxygen evolution, Dehua Xiong, Qingqing Zhang, Wei Li, Junjie Li, Xiuli Fu, M. F. Cerqueira, Pedro Alpuim, and Lifeng Liu, Nanoscale, 9 (2017) 2711-2717; http://hdl.handle.net/1822/48471

Characterization of magnetron sputtered sub-stoichiometric CrAlSiNx and CrAlSiOyNx coatings, A. Al-Rjoub, P. Costa, L. Rebouta, M. F. Cerqueira, P. Alpuim, N. P. Barradas, and E. Alves, Surface and Coatings Technology, 328 (2017) 134-141; http://hdl.handle.net/1822/48540

Controlling spoof plasmons in a metal grating using graphene surface plasmons, E. J. C. Dias and N. M. R. Peres, ACS Photonics, 4 (2017) 3071–3080; http://hdl.handle.net/1822/47627

Epitaxial CuInSe2 thin films grown by molecular beam epitaxy and migration enhanced epitaxy, K. Abderrafi, R.-Ribeiro Andrade, N. Nicoara, M. F. Cerqueira, M. Gonzalez Debs, H. Limborço, P. M. P. Salomé, J. C. Gonzalez, F. Briones, J. M. Garcia, and S. Sadewasser, Journal of Crystal Growth, 475 (2017) 300-306; http://hdl.handle.net/1822/48546

Excitonic effects in the optical properties of 2D materials: An equation of motion approach, A. J. Chaves, R. M. Ribeiro, T. Frederico, and N. M. R. Peres, 2D Materials, 4 (2017) 025086; http://hdl.handle.net/1822/47442

Flexible solid-state Ge – LiCoO2 battery: From materials to device application, Eliana M. F. Vieira, João F. Ribeiro, Rui Sousa, Anabela G. Rolo, M. Manuela Silva, and Luís M. Gonçalves, Advanced Materials Letters, 8 (2017) 820-829; http://hdl.handle.net/1822/47990

Fluorescent phenanthroimidazoles functionalized with heterocyclic spacers: synthesis, optical chemosensory ability and two-photon absorption (TPA) properties, Rosa C. M. Ferreira, Susana P. G. Costa, Hugo Gonçalves, Michael Belsley, and M. Manuela M. Raposo, New Journal of Chemistry, 41 (2017) 12866-12878; http://hdl.handle.net/1822/48423

Fluorescent probes based on side-chain chlorinated benzo[a]phenoxazinium chlorides: Studies of interaction with DNA, B. Rama Raju, M. Sameiro T. Gonçalves, and Paulo J. G. Coutinho, Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy, 171 (2017) 1-9; http://hdl.handle.net/1822/44063

Gauge covariances and nonlinear optical responses, G. B. Ventura, D. J. Passos, J. M. B. Lopes dos Santos, J. M. Viana Parente Lopes, and N. M. R. Peres, Physical Review B, 96 (2017) 035431; http://hdl.handle.net/1822/47444

Hybrid Plasmons in 2D Nano-slits: From Graphene to Other 2D Materials, P. A. D. Gonçalves, Sanshui Xiao, N. M. R. Peres, and N. Asger Mortensen, ACS Photonics, 4 (2017) 3045–3054; http://hdl.handle.net/1822/47628

Impact of graphene on the polarizability of a neighbour nanoparticle: a dyadic Green's function study, Bruno Amorim, P. A. D. Gonçalves, M. I. Vasilevskiy, and N. M. R. Peres, Applied Sciences–Basel, 7 (2017) 1158; http://hdl.handle.net/1822/47613

Improvements in the GW and Bethe-Salpeter-equation calculations on phosphorene, F. Ferreira, R. M. Ribeiro, Physical Review B, 96 (2017) 115431; http://hdl.handle.net/1822/47475

Magnetoliposomes as carriers for promising antitumor thieno[3,2-b]pyridin-7-arylamines: photophysical and biological studies, Ana Rita O. Rodrigues, B. G. Almeida, Juliana M. Rodrigues, Maria João R. P. Queiroz, R. C. Calhelha, Isabel C. F. R. Ferreira, A. Pires, A. M. Pereira, J. P. Araújo, Paulo J. G. Coutinho, and Elisabete M. S. Castanheira, RSC Advances, 7 (2017) 15352-15361; http://hdl.handle.net/1822/46111

Numerical simulation of breast reduction with a new knitting condition, D. Lopes, S. Clain, R. Pereira, G. Machado, G. Smirnov, I. Vasilevskiy, International Journal for Numerical Methods in Biomedical Engineering, 33 (2017) e02796; http://hdl.handle.net/1822/43610

Raman and IR-ATR spectroscopy studies of heteroepitaxial structures with a GaN:C top layer, M. F. Cerqueira, L. G. Vieira, A. A. Alves, R. Correia; M. Huber, A. Andreev, A. Bonanni, and M. Vasilevskiy, Journal of Physics D: Applied Physics, 50 (2017) 365103; http://hdl.handle.net/1822/47699

Reductive nanometric patterning of graphene oxide paper using electron beam lithography, Jérôme Borme, Igor Bdkin, Ankor González-Mayorga, Gonzalo Irurueta, Helena I. S. Nogueira, María C. Serrano,

Pedro Alpuim, and Paula A. A. P. Marques, Carbon 129 (2018) 63-75; http://hdl.handle.net/1822/48558

Self-assembled dehydropeptide RGD hydrogels for drug delivery applications, H. Vilaça, T. Castro, Fernando M. G. Costa, M. Melle-Franco, L. Hilliou, I. W. Hamley, Elisabete M. S. Castanheira, J. A. Martins, and P. M. T. Ferreira, Journal of Materials Chemistry B, 5 (2017) 8607-8617; http://hdl.handle.net/1822/47150

SiGe layer thickness effect on the structural and optical properties of well-organized SiGe/SiO2 multilayers, E. M. F. Vieira, J. Toudert, A. G. Rolo, A. Parisini, J. P. Leitão, M. R. Correia, N. Franco, E. Alves, A. Chahboun, J. Martín-Sánchez, R. Serna, and M. J. M. Gomes, Nanotechnology, 28 (2017) 345701 (12pp); http://hdl.handle.net/

Solid and aqueous magnetoliposomes as nanocarriers for a new potential drug active against breast cancer, Ana Rita O. Rodrigues, Pedro M. F. Mendes, Pedro M. L. Silva, V. A. Machado, Bernardo G. Almeida, J. P. Araújo, Maria-João R. P. Queiroz, Elisabete M. S. Castanheira, and Paulo J. G. Coutinho, Colloids and Surfaces B: Biointerfaces, 158 (2017) 460-468; http://hdl.handle.net/1822/ 46278

Synthesis and characterisation of push-pull flavin dyes with efficient second harmonic generation (SHG) properties, Nabeel Mohammed, Alan A. Wiles, Michael Belsley, Sara S. M. Fernandes, Michele Cariello, Vincent M. Rotello, M. Manuela M. Raposo and Graeme Cooke, RSC Advances, 7 (2017) 24462-24469; http://hdl.handle.net/1822/48268

Thickness dependence of microstructure in thin La0.7Sr0.3MnO3 films grown on (100) SrTiO3 substrate", PM Vaghefi, A Baghizadeh, MG Willinger, MJ Pereira, DA Mota, BG Almeida, JA Moreira, VS Amaral, J. Phys. D-Appl. Phys., 395301, (2017)

Universal description of channel plasmons in 2D materials, P. A. D. Gonçalves, Sergey I. Bozhevolnyi, N. Asger Mortensen, and N. M. R. Peres, Optica, 4 (2017) 595; http://hdl.handle.net/1822/47446

Vapor-Solid Synthesis of Monolithic Single-Crystalline CoP Nanowire Electrodes for Efficient and Robust Water Electrolysis, Wei Li, Xuefei Gao, Dehua Xiong, Fang Xia, Jian Liu, Wei-Guo Song, Junyuan Xu, Sitaramanjaneya Mouli Thalluri, M. F. Cerqueira, Xiuli Fue and Lifeng Liu, Chemical Science, 8 (2017) 2952-2958; http://hdl.handle.net/1822/48545

Wafer scale fabrication of graphene microelectrode arrays for the detection of DNA hybridization, R. Campos, G. Machado Jr., M. F. Cerqueira, J. Borme, and P. Alpuim, Microelectronic Engineering (2017) accepted manuscript; DOI: 10.1016/j.mee.2017.12.015; http://hdl.handle.net/1822/48567

Other Articles

A new synthetic route for compounds prepared from Keggin heteropolyacids and pyridine derivatives, F. M. Santos, H. I. S. Nogueira, A. M. V. Cavaleiro, E. de Matos Gomes, M. Belsley, Inorganica Chimica Acta, 455 (2017) 600-606; http://hdl.handle.net/1822/43498

An escape of vector matter-wave soliton from a parabolic trap, Y. V. Bludov, and M. A. García-Ñustes, Journal of Physics B: Atomic, Molecular and Optical Physics, 50 (2017) 135004; http://hdl.handle.net/1822/46033

On the Use of Controlled Radiation Pressure to Send a Satellite to a Graveyard Orbit, J. B. Silva Neto, D. M. Sanchez, A. F. B. A. Prado, G. V. Smirnov, Revista Mexicana de Astronomía y Astrofísica, 53 (2017) 321-332; http://hdl.handle.net/1822/48452

Vector variational problem with knitting boundary conditions, G. Carita, V. Goncharov, and G. Smirnov, Quarterly of Applied Mathematics, 75 (2017) 249–265; http://hdl.handle.net/1822/42835

6.2.3.2. Books chapters

Lipid-based colloidal carriers for topical application of antiviral drugs, Carla M. Lopes, Juliana Silva, M.E.C.D. Real Oliveira, and Marlene Lúcio, Book chapter in Design of nanostructures for versatile therapeutic applications, edited by Alexandru Mihai Grumezescu, Elsevier, Volume III, 2017; DOI: 10.1016/B978-0-12-813667-6.00014-0.

Magnetoliposomes for dual cancer therapy", in Pharmaceutical Nanotechnology Series, Vo. 7: "Inorganic frameworks as smart nanomedicines", A.R.O. Rodrigues, B.G. Almeida, M.J.R.P. Queiroz, J.P. Araújo, P.J.G. Coutinho, E.M.S. CastanheiraChapter 11, A. M. Grumezescu (Editor), Elsevier, in press., 2017

6.2.3.3. Conference Proceedings with Pier Review appearing in the ISI Database

Electromagnetic properties of a monolayer of polarisable particles deposited on graphene, André Souto, Rui M. Pereira, Jaime E. Santos, N. M. R. Peres and M. I. Vasilevskiy, Proc. SPIE v. 10453 (2017), 104530V; doi: 10.1117/12.2271960; http://hdl.handle.net/1822/47653

Rheology Characterization of Solder Paste, Flávia Barbosa, Pedro E. A. Ribeiro, M. F. Cerqueira, Delfim Soares, José C. F. Teixeira, Senhorinha F. C. F. Teixeira, Rui A. M. M. Lima, Diana M. D. Pinho, Proceedings of the ASME 2017 International Mechanical Engineering Congress and Exposition, IMECE2017-71413 (2017).

Visco-elastic systems as a quadratic eigenvalue problem", AIP Conference Proceedings 2017, Forjaz, M. A., Almeida, A.M., Fernandes, L.M., Pamplona, J. and de Lacerda-Arôso, T., doi: http://dx.doi.org/10.1063/1.4992430

Comparison of lenses' thermal expansion formulation in Zemax versus ANSYS with SigFit post processing, João Faria; J. L. Alves; Eduardo J. Nunes-Pereira; doi: 10.1117/12.2280758 SPIE, Optomechanical Engineering, 103710, 103710R (2017)

6.2.3.4. International Patents

Material structure for a solar cell and a solar cell comprising the material structure - EP16190415.6 (P. Alpuim)

6.2.4. Conference Presentations

6.2.4.1. Invited talks delivered at Conferences (International/National)

International

Plasmonic effects in metal gratings coated with 2D materials, N. M. R. Peres, Nanophotonics of 2D materials, San Sebastian, 31 July-3 August 2017 (International Conference).

Plasmonic properties of graphene: Graphene on gratings and plasmonic wakes, N. M. R. Peres, Solvay workshop: From the physics of graphene to graphene for physics, Brussels, 6-8 September 2017 (International Conference).

Explicit bounds for Lipschitz constant of solution to basic problem in calculus of variations, G. Smirnov, Workshop on Nonlinear Analysis and Optimization - 60th anniversary of Aram Arutyunov, Porto, 19-21 April, 2017 (International Conference).

On the regularity of solutions to optimal control problems, G. Smirnov, New Horizons in Optimal Control (NHOC), Porto, 3-5 July, 2017 (International Conference).

Ab initio calculations of the optical properties of 2D materials, Ricardo Mendes Ribeiro, Topical Meeting on Single Quantum Emitters, INL, Braga, 4-6 October 2017 (International Conference).

Monoolein-based nano carriers for medical applications, M. E. C. D. Real Oliveira, 3rd International Conference on Medical Physics & Biomedical Engineering, 7-8 November 2017, Barcelona, Spain (International Conference).

Role of counter-ion and helper lipid content in the design and properties of siRNA nanosystems: a biophysical and biological study, M. E. C. D. Real Oliveira, RICI7 - VII Iberian Meeting on Colloids and Interfaces, 4-7 July 2017, Madrid, Spain (Iberian Conference).

Lipid nanosystems for therapeutic purposes – biophysical studies as useful tools to understand interactions at the nano-bio interface, Marlene Lúcio, RICI7 - VII Iberian Meeting on Colloids and Interfaces, 4-7 July 2017, Madrid, Spain (Iberian Conference).

Graphene Functionalized Field-Effect Transistors for Biomedical Applications, P. Alpuim, R. Campos, E. Fernandes, G. Machado Jr., P. D. Cabral, and J. Borme, International Conference on Graphene and Semiconductors, July 17-18, 2017, Chicago, USA (International Conference)..

National

Plasmonic effects in graphene, N. M. R. Peres, I Meeting of the Carbon Group, Porto, Portugal, 12 June 2017 (National Conference).

Nanoplasmonic Thin Films for LSPR-(Bio)Sensing, Joel Borges, Workshop Vácuo 2017, 21 July 2017, Inst. Pedro Nunes, Coimbra, Portugal (National Conference).

6.2.4.2. Contributed talks delivered at Conferences (International/National)

International

Structural and dielectric properties of laser annealed multiferroic nanostructures", J.R. Alves, J. Oliveira, A.G. Rolo, J.A. Mendes, E.Venkata Ramana, M.P.F.Graça, M.A. Valente, B.G. Almeida, comunicação oral apresentada no "VIII International Symposium on Materials", Aveiro, 9-12 abril, 2017

Attomolar label-free detection of DNA hybridization with electrolyte-gated graphene field effect transistors, P. Alpuim, R. Campos, G. Machado Jr, M. F. Cerqueira, and J. Borme, Graphene2017, March 28-31, 2017, Barcelona, Spain (International conference; oral).

Biosensing with Graphene Field-Effect Transistors, J. Borme, R. Campos, G. Machado Jr., P. D. Cabral, M. F. Cerqueira, and P. Alpuim, NanoBioSensors 2017, Sept 4-5, Dresden, Germany (International conference; oral).

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Development of lipid-based colloidal nanocarriers for topical application of acyclovir, Juliana Silva, C. Martins Lopes, J. A. M. Catita, M. E. C. D. Real Oliveira, and Marlene Lúcio, RICI7 - VII Iberian Meeting on Colloids and Interfaces, Madrid (Spain), 4-7 July 2017 (Iberian conference; oral).

Drug biophysical profiling using lipid-based colloidal nanosystems and human serum albumin as biomimetic interfaces, E. Fernandes, M. E. C. D. Real Oliveira, S. Benfeito, F. Cagide, F. Borges and M.

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Chemical Vapor Deposition and characterization of h-BN, Balji Sompalle, Jérôme Borme, Fátima Cerqueira, Rui Campos, and Pedro Alpuim, QuantaLab workshop 2017, Sept 12, INL Braga, Portugal.

Towards a graphene-based biosensing platform, Jérôme Borme, R. Campos, E. Fernandes, P. Cabral, G. Machado Jr, M. F. Cerqueira, and P. Alpuim, Seminars of Materials Science Engineering, University of Aveiro, Portugal, 12 July 2017.

Innovative nanocarriers for siRNA delivery, M. E. C. D. Real Oliveira, seminar on the Advanced Course "Cancer therapy: from basic research to clinic", CBMA – UMinho, Braga, May 2017.

Fighting cancer with Nanomedicine, Marlene Lúcio, seminar on the Advanced Course "Cancer therapy: from basic research to clinic", CBMA – UMinho, Braga, May 2017.

Nanocarriers as strategies to improve bioavailability of bioactive neuroprotective compounds, M. E. C. D. Real Oliveira, seminar on the Advanced Course "Oxidative stress and antioxidants", CBMA – UMinho, Braga, June 2017.

Use of liposomes as models for the evaluation of the role of biological membranes in the antioxidant activity, Marlene Lúcio, seminar on the Advanced Course "Oxidative stress and antioxidants", CBMA – UMinho, Braga, June 2017.

Magnetic nanoparticles covered by or entrapped in lipid bilayers: Advances towards dual cancer therapy", A.R.O. Rodrigues, B.G. Almeida, J.P. Araújo, M.R.P. Queiroz, P.J.G. Coutinho, E.M.S. Castanheira, comunicação oral apresentada na "NaNaX8 - Nanoscience with Nanocrystals", 3-7 julho, Braga, 2017

Graphene nano-ribbons for molecular sensing, Mikhail Vasilevskiy, PIERS 2017 - Progress In Electromagnetics Research Symposium, 19-22 November 2017, Singapore, www.piers.org (International conference; oral).

Graphene Field-Effect Transistors for Biomedical Applications, R. Campos, E. Fernandes, G. Machado Jr., P. D. Cabral, M. F. Cerqueira, J. Borme and P. Alpuim, EGF- European Graphene Forum 2017, 26-28 April 2017, Paris, France (International conference; oral).

Biosensing with Graphene Field-Effect Transistors, J. Borme, R. Campos, E. Fernandes, G. Machado Jr., P. D. Cabral, M. F. Cerqueira, and P. Alpuim, MNE2017, Sept 18-22, Braga, Portugal (International conference; oral).

Optimization of Au/TiO2 thin films towards optical (bio)sensing, M. S. Rodrigues, J. Borges, D. Costa, R. P. Domingues, M. Apreutesei, P. Pedrosa, N. Martin, E. Alves, N. P. Barradas, P. Sampaio, and F. Vaz, 10th International Conference on Materials Science & Engineering (BRAMAT 2017), 8-11 March 2017, Brasov, Romania (International conference; oral).

National

Label-Free detection of DNA hybridization with graphene field-effect transistors, R. Campos, J. Borme, G. Machado Jr, M. F. Cerqueira, and Pedro Alpuim, I Reunião do Grupo do Carbono, 12-13 June 2017, Porto, Portugal (National conference; oral).

Laser annealed multiferroic nanostructures", J.R. Alves, B.G. Almeida comunicação oral apresentada no "DCE2017 – Simpósio doutoral em Engenharia Física", 8-9 junho, Porto, 2017

Solid and Aqueous Magnetic Liposomes as Nanocarriers for a New Potential Drug Active Against Breast Cancer", A.R.O. Rodrigues, P.M.L. Silva, B.G. Almeida, J. P. Araújo, M.J.R.P. Queiroz, E.M.S. Castanheira, P.J. G. Coutinho, NanoPT2017 Nanoscience and Nanotechnology International conference, Porto, February 1-3, 2017

Micro - e Nanofibras multiferróicas preparadas por electrospinning ", V. Gomes, E. Gomes, BG Almeida, Dia Mundial dos Materiais, Univ. Beira Interior, Covilhã, 8 Nov., 2017

6.2.4.3. Conference organization (International/National)

International

10th International Conference on Computational Physics, Mikhail Vasilevskiy - Member of International Advisory Board, 16-20 Jan 2017, Macao, PRC (ca 500 participants).
AOP2017: 3rd International Conference on Applications of Optics and Photonics, Mikhail Vasilevskiy - Member of the Scientific Commission 8-12 May 2017, Faro, Portugal (ca 150 participants).

MNE2017 Conference, INL Braga, Portugal, Sept 18-22, 2017 P. Alpuim - Member of the International Program Committee (741 participants).

RICI7: VII Iberian Meeting on Colloids and Interfaces, M. Elisabete C. D. Real Oliveira - Member of the Scientific Committee Madrid (Spain), 4-7 July 2017.

NANAX8: 8th International Conference on Nanoscience with Nanocrystals, Mikhail Vasilevskiy (Co-chairman), M. Fátima Cerqueira and Paulo J. G. Coutinho – Members of the Organising Committee, Manuel Filipe Costa – member of the Local Organising Committee Braga, Portugal, 3-7 July 2017 (ca 160 participants).

National

Seminar "Large Area 2D heterostructures for photodetectors", Organiser: Ricardo Ribeiro; Braga, 8 February 2017.

6.2.5. Supervision of Research Students

6.2.5.1. PhD projects completed in 2017

Author	Supervisor	Title	Situation
Sara Filomena Ribeiro Pimenta	Supervision: Graça Minas (CMEMS) and Elisabete M. S. Castanheira Coutinho (CFUM);	Optical Microsystem for Spectroscopy Signals Extraction Applied to Gastrointestinal Dysplasia Detection	Biomedical Engineering Doctoral Program, EEUM.
Rosa Cristina Moutinho Ferreira	Supervision: Maria Manuela Raposo (CQUM), Susana P. G. Costa (CQUM) and Michael Belsley (CFUM),	Innovative p-conjugated heterocyclic systems as optical chemosensors and two-photon absorbing (TPA) chromophores: design, synthesis, characterization and development for applications;	PhD in Sciences – specialization in Chemistry, ECUM.
Eliana Tiba Gomes Grande	G. Smirnov	Geração automática de exercícios para sistemas de ensino personalizado de Programação	PhD in Sciences – specialization in Mathematics, ECUM.

6.2.5.2. PhD projects in progress

Author	Supervisor	Title	Situation
Ana Rita Oliveira Rodrigues	Supervision: Paulo J. G. Coutinho and Elisabete M. S. Castanheira Coutinho	Magnetoliposomes based on nickel/silica and ferrite nanoparticles as nanocarriers for potential antitumor drugs	MAP-Fis PhD Programme, ECUM
André Chaves	Supervision: N. M. R. Peres	to be defined	PhD in Sciences - specialization in Physics, ECUM.
César Rui Freitas Bernardo	Supervision: M. Belsley and M. Vasilevskiy	Energy transfer dynamics and light-harvesting in Quantum Dots structures	PhD in Physics MAP-Fis, ECUM
Filipe André Peixoto Oliveira	Supervision: Mikhail Vasilevskiy and M. Fátima Cerqueira,	Photonic integrated circuit (PIC) devices for inter- and intra-chip optical communication using GeSn alloy layers grown on Silicon substrates	PhD in Physics MAP-Fis, ECUM.
Gonçalo Catarina	Supervision: N. M. R. Peres	MAP-FIS PhD Programme, ECUM	
Hugo Manuel Castro Gonçalves	Supervision: M. Belsley	Unusual photonic properties of doped nano-structured polymeric fibers	PhD in Physics MAP-Fis, ECUM.

Luís Martins	Supervision: N. M. R. Peres	PhD programme in "Ciências e Engenharia de Polímeros e Compósitos".	
Ícaro Jael Mendonça Moura	Supervision: Ricardo Mendes Ribeiro	Estudo de heteroestruturas de materiais bidimensionais	MAP-Fis Doctoral Program, CAPES Grant (Brazil), ECUM.
Isabel Cristina Azevedo Machado de Araújo	Supervision: G. Smirnov	Geração automática de exercícios para sistemas de ensino personalizado de Matemática	ECUM.
Nuno Miguel Teles Oliveira	Supervision: G. Smirnov	Complexidade de métodos de ponto interior aplicados a problemas de optimização de dimensão infinita	ECUM.
Balaji Sompalle	Supervision: Pedro Alpuim	Fabrication of a photodetector based on 2D vertical van der Waals heterostructures	PhD in Physics MAP-Fis, ECUM.
Patrícia Daniela Cabral da Silva	Supervision: Pedro Alpuim, co-supervision: Elisabete Fernandes (INL)	Immuno-field-effect transistor platforms based on 2D materials for early detection of biomarkers of ischemic stroke	PhD in Physics MAP-Fis, ECUM.
Ramya Gummadi	Supervision: Sascha Sadewasser (INL), co-supervision: Pedro Alpuim	Optoelectronic Characterization of Chalcogenide Solar Cells and 2D Materials	PhD in Physics MAP-Fis, ECUM
Andreia Marina de Sousa Almeida	Supervision: Bruno Sarmento (i3S), co-supervison: Marlene Lúcio and Helder A. Santos (Univ. Helsinki, Finland),	Mucoadhesive camptothecin polymeric micelles as nanodelivery systems for oral chemotherapy to treat colorectal cancer	PhD Program in Biomedical Sciences, ICBAS - Univ. Porto.
George Luiz Machado Junior	Supervision: Pedro Alpuim	Graphene nanoelectronic devices for biomedical and flexible electronic applications	PhD in Materials Engineering, EEUM.
Catarina Abreu	supervision: Steve Conlan, co-supervision: Inês Pinto, Pedro Alpuim	Graphene EGFET Sensors for Enhanced *in vitro* Fertilisation Outcomes and Gynaecological Cancer Detection	PhD in Human and Health Sciences, Swansea University Medical School, UK

6.2.5.3. MSc projects completed in 2017

Author	Supervisor	Title	Situation
João Rodolfo Alves	Bernardo Almeida	Filmes Finos de Materiais Óxidos por Ablação Laser	Mestrado em Física
Pedro Rego	Bernardo Almeida	Micro e Nanofibras com propriedades multiferroicas	Mestrado Integrado em Engenharia de Materiais EEUM
Joana Isabel Oliveira Gomes de Matos	Supervision: Elisabete M. S. Castanheira Coutinho and Paulo J. G. Coutinho	Desenvolvimento de magnetolipossomas baseados em ferrites com coroa de ouro para terapêutica do cancro	Master in Biophysics and Bionanosystems, ECUM
Maria Margarida de Almeida Cautela	Supervision: Paulo J. G. Coutinho and Senen Lanceros-Méndez	Dispositivos biossensoriais baseados na associação de biomoléculas a superfícies de ouro	Master in Biophysics and Bionanosystems, ECUM.
Diogo Emanuel Carvalho Costa	Supervision: Joel Borges and Ana Paula Sampaio (CBMA)	Otimização de filmes finos nanoplasmónicos, constituídos por nanopartículas de Au dispersas em TiO_2, para aplicação em biossensores óticos	Master in Biophysics and Bionanosystems, ECUM.
Fernando Miguel Gonçalves Costa	Supervision: Elisabete M. S. Castanheira Coutinho and Paula M. T. Ferreira (CQUM)	Síntese de um novo hidrogel peptídico contendo RGD e avaliação como transportador do fármaco curcumina	- Master in Biophysics and Bionanosystems, ECUM.
Eduarda Barbosa Fernandes	Marlene Lúcio and Jana Nieder (INL)	Perfil ADMET de parâmetros farmacocinéticos para apoio à síntese de novos fármacos,	- Master in Biophysics and Bionanosystems, ECUM.
Telma Bezerra Soares	Supervision: M. Elisabete C. D. Real Oliveira and Alberto Dias (CBMA)	Desenvolvimento de nanossistemas para a encapsulação de agentes neuroprotetores	- Master in Biophysics and Bionanosystems, ECUM.
Juliana Filipa Gomes Silva	Supervision: Marlene Lúcio and Carla Lopes (Univ. Fernando Pessoa)	Desenvolvimento de uma formulação dermocosmética para o tratamento e prevenção de infeções herpéticas	Master in Biophysics and Bionanosystems, ECUM
Célia de Jesus Sousa Barbosa	M. Elisabete C. D. Real Oliveira and Hernâni Gerós (CBMA)	Internalization of resveratrol nanoparticles in yeast and bioactivity	- Master in Biophysics and Bionanosystems, ECUM.

Tiago Miguel Castro Costa	Supervision: Marlene Lúcio and Teresa Viseu	Desenvolvimento de um sistema nanostruturado para coencapsulação de aciclovir e ácidos gordos ómega-3 por *electrospinning*	Master in Biophysics and Bionanosystems, ECUM
Gustavo Adolfo Coelho Marín	Supervision: Elisabete M. S. Castanheira Coutinho and Madalena Lira	Variação da Transmitância, Refletância e Índice de Refração das Lentes de Contacto: Influência da Potência e do Material das Lentes	Master in Advanced Optometry, ECUM
Diogo Manuel Pacheco Teixeira	Supervision: Paulo J. G. Coutinho	Células fotovoltaicas de Grätzel usando cossensibilização de pontos quânticos de CdS/CdSe	Master in Environmental Science and Technology - Energy, ECUM
Jacinto João Lemos Freitas	Supervision: Paulo J. G. Coutinho	Células fotovoltaicas de Grätzel usando cossensibilização de pontos quânticos de Cu_2S/SnS	Master in Environmental Science and Technology - Energy, ECUM
Nélson Emanuel Salgado Teixeira	Supervision: Paulo J. G. Coutinho	Nanostruturas mistas contendo perovskite $BaSnO_3$ e pontos quânticos de CdTe para fotoconversão da água em hidrogénio usando poluentes modelo como doadores sacrificiais	Master in Environmental Science and Technology - Energy, ECUM
João Oliveira	Supervision: Bernardo G. Almeida	Modelização de espetros de raios-X em filmes finos	Master in Physics, ECUM
Paulo Alexandre de Carvalho	supervision: J. Pedro Alpuim	Graphene Growth, Extraction, Characterization and Implementation	Master in Technological Physics Engineering, IST-UL

6.3 Functional and smart materials and surfaces for advanced applications

6.3.1 Researchers

Principal investigator	Senen Lanceros-Mendez/Martin Andritschky
Members	**<u>Effective members of the Centre</u>** - Cacilda Moura - Carlos Tavares - Diego Martinez - Etelvina Gomes - José Filipe Vilela Vaz - Francisco Macedo - Joaquim Carneiro - Luís Cunha - Luís Rebouta - Luis Marques - Manuel Costa - Maria Gomes - Mário Pereira - Marta Ramos - Martin Andritschky - Sandra Carvalho - Senentxu Mendez - Stanislav Ferdov - Vasco Teixeira **Collaborators** <u>Staff members with PhD</u> - Jorge Mendes (Polytechnical Institute, Vila do Conde) - Li-Jian Meng (Porto) - Maria Teresa Pitta de Lacerda-Arôso(UM) - Mário Almeida (UM) - Mário Zamith (UM) <u>Post-Doctorate Researchers</u> - António Francesko –SFRH/BPD/104204/2014 (100%) - Armando Ferreira –SFRH/BPD/102402/2014 (100%) - Carlos Costa –SFRH/BPD/112547/2015 (100%) - Catalina Mansilla Sanchez - SFRH/BPD/105068/2014 (100%) - Clarisse Ribeiro –- SFRH/BPD/90870/2012 (100%) - Filipe Fernandes - SFRH/BPD/116334/2016 (100%) - Isabel Carvalho –- Projeto n° 006684 - Minho-BIO/04469 (50%) - José Pedro Basto da Silva (Post-Doc FCT: SFRH/BPD/92896/2013) - Margarida Fernandes - SFRH/BPD/121464/2016 (70%) - Paulo Pedrosa - UMINHO/BPD/26/2017 (100%) - Pedro Costa –SFRH/BPD/110914/2015 (50%)

	- Pedro Libanio Martins–SFRH/BPD/96227/2013 (100%) - Sebastian Calderon Velasco – ERA-SIINN/0004/2013 (UMINHO/BPD/11/2016) (100%) - Sergey Pyrlin – European project TheLink (UMINHO/BGCT/08/2016) (100%) - Vanessa Cardoso – SFRH/BPD/98109/2013 (30&) - Vitor Correia – SFRH/BPD/97739/2013 (50%) (50%) <u>Integrated PhD students</u> - Al-Rjoub MSc. PhD in Sciences, MAP-FIS - Ana Catarina Branco Lima Engenharia de Materiais - Atilla Goren - Science Phd Program - Bruna Gonçalves Programa Doutoral em Engenharia de Materiais - Cláudia de Jesus Ribeiro Lopes, MSc. PhD in Sciences - Cristiana Alves - Engeneering Phd Program – FCT Fellowship - Daniel António da Silva Miranda - Science Phd Program - Diogo Cavaleiro – Engeneering Phd Program - Edgar Carneiro - Engeneering Phd Program – Project Fellowship - Filipe Costa Correia, PhD Student EEUM - Gabriel Mendes - Engeneering Phd Program – FCT Fellowship - Hugo Salazar FCT, SFRH/BD/122373/2016 - Jivago Serrado Gomes Aguiar Nunes; Engenharia de Materiais - Juliana Alice Ferreira Oliveira Programa Doutoral em Engenharia de Materiais - Juliana Dias - Science Phd Program - Juliana Marques, PhD Student EEUM - Luísa Fialho - Engeneering Phd Program – Project Fellowship - Marco Pires Rodrigues – Map-Fis– FCT Fellowship - Marta Adriana Forte, PhD Student Doctorate Program - Ricardo Sousa - Science Phd Program – FCT Fellowship - Sylvie de Oliveira Ribeiro Programa doutoral em engenharia de materiais - Veniero Lenzi - Science Phd Program – Project Fellowship - Vitor Vasconcelos - Science Phd Program – FCT Fellowship <u>PhD students – Members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time Ph-D students</u> - Paulo Sousa - Engeneering Phd Program – FCT Fellowship - Pedro Manuel Abreu Martins Doutoramento em Ciencias - Renato Gonçalves - Engeneering Phd Program – FCT Fellowship - Rita Ferreira - Engeneering Phd Program – FCT Fellowship - Rita Rebelo - Engeneering Phd Program – FCT Fellowship - Salmon Landi - Science Phd Program – CAPES Fellowship - Silvia Reis - Engeneering Phd Program – FCT Fellowship - Simone Rodrigues - Engeneering Phd Program – FCT Fellowship - Sofia Ferreira - Engeneering Phd Program - Vania Pinto - Engeneering Phd Program – FCT Fellowship <u>Other research students</u> - Carlos Costa; Title: Novel nanomaterials and consepts for advanded re-chargable lithium-ion batteries (Ongoing); FCT, SFRH/BPD/112547/2015 - Catarina Isabel da Silva Oliveira FCT Project - Joana Ribeiro, Research Assistant w/ fellowship

	- João Pereira; TecMinho Project - Marco Silva; FCT Project - Paulo Salvador, Research Assistant w/ fellowship - Tiago David Gomes, Research Assistant w/ fellowship

6.3.2 Brief description of the scientific work carried out within the Research Line in 2017

In 2017 the focus of the work was directed to the developmet of materials, mainly multiple alloy oxides and nitrides and the study of the electrical, magnetic optical and othe physical properties of those materials having in mind applications like sensors, actuators and other kind of functionalization. One major technique for the material development was thin film deposition by magnetron sputtering and laser ablation. Other techniques techniques mainly tried to functionalize the materials also by nano and micro structuring. Examples of the material development are and their applications are:

1. Lead free ferroelectrics: Development of lead-free ferroelectric ceramics and thin films based on x(Ba,Ca)TiO3-(1-x)(Ba,Zr)TiO3 (with x= 0.4, 0.5 or 0.6) with the aim to exhibit the ferroelectric and dielectric properties equivalent of PbZrTiO3 (PZT).
2. transparent thermoelectric thin films for photovoltaic and touch displays applications
3. solar-activated microcapsules for controlled release of substances
4. Antibacterial coatings: Zr-C-N-Ag, DLC+Ag, AgO,
5. Antimicrobial bimetallic clusters – ZnO
6. free standing metal nanoparticles on a substrate and/or embedded in transparent dielectric thin films (SiC, Si3N4, ZrO2, Al2O3, HfO2, HfAlO etc) in order to tailor the final properties for chemical, bio-sensor and photovoltaic applications.
7. selective absorption of solar radiation for high temperature applications with structures based on nitride/oxynitride or ceramic/metal composites.
8. Study and production of functionalized textiles substrates to promote de-pollution of conventional industrial effluents, general liquid media and also soils contaminated with petroleum derivatives. According the type of application, the bare textile substrates are selectively functionalized with SiO2-TiO2-HY composites or TiO2-reduced graphene oxide.
9. Synthesis of new materials for cathodes and anodes of lithium-based batteries.
10. Optimized synthesis of LiFePO4 - a high performance cathode for lithium-based batteries.
11. innovative solutions to control dynamically the temperature of the injection molding process of polymeric parts using thin films (for temperature and pressure control

6.3.3 Future research summary

The future research continues most of the present activities within running projects.

Additionally:

1. Desenvolvimento de materiais multifuncionais para sensores e atuadores, energia e aplicações biomédicas com atenção a materiais piezoelectricos, piezoresistivos e magnetoelectricos na area de sensores; separadores de baterias e “actie materials” na area da energia; e materiais piezoelectricos, biogels e loquidos ionicos na area biomédica. Especial atenção ao processamento por tecnologias de impresao em todas as areas enteriormente indicadas.

2. Development of the work of the M-ERA-NET project ALD4MAX (Atomic Layer Deposition For tailored bottom-top growth of MAX and MXene films),
3. Development of cermets by the co-deposition of the two materials in same magnetron sputtering chamber. In the second, nanoparticles will be first nucleated in a supersaturated gas using a magnetron sputter source operating at a primary vacuum in an auxiliary chamber, and then will be ejected to a main chamber using a differential pumping system, where the ceramic matrix is being deposited
4. Plasmonics: Continuation of the growth and study of novel plasmonic structures
5. development of AAO structures with controlled pore diameter and having columns with low tortuosity in order to be applied as separators for lithium ion batteries.

6.3.4 Publications

6.3.4.1 Regular articles published in ISI/Scopus Journals

A new synthetic route for compounds prepared from Keggin heteropolyacids and pyridine derivatives, F. M. Santos, H. I. S. Nogueira, A. M. V. Cavaleiro, E. de Matos Gomes, M. Belsley, Inorganica Chimica Acta, 455 (2017) 600-606; http://hdl.handle.net/1822/43498

Approaching an Overdamped System as a Quadratic Eigenvalue Problem. Forjaz M. A., Almeida M., Fernandes L. M., Pamplona J., Lacerda–Arôso T. Applied Mathematics & Information Sciences 11 (4)(2017).

Capture and separation of L-histidine through optimized zinc-decorated magnetic silica spheres (2017) Cardoso, V.F., Sebastián, V., Silva, C.J.R., Botelho, G., Lanceros-Méndez, S. Colloids and Surfaces B: Biointerfaces, 157, pp. 48-55. DOI: 10.1016/j.colsurfb.2017.05.009

Carbon-Based Sputtered Coatings for Enhanced Chitosan-Based Films, C. Fernandes; S. Calderon V., L. F Ballesteros; M. A Cerqueira; L. M Pastrana, J. A. Teixeira; P. J. Ferreira; S. Carvalho, Applied Surface Science, 433 (2017) 689-695. Quartile: Q1. Impact factor: IF: 3.387. https://doi.org/10.1016/j.apsusc.2017.10.088

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Development of Au/CuO nanoplasmonic thin films for sensing applicationsM. Proença, J. Borges, M. S. Rodrigues, R. P. Domingues, J. P. Dias, J. Trigueiro, N. Bundaleski, O. M. N. D. Teodoro, and F. Vaz, , Surface and Coatings Technology (2017) accepted manuscript;. DOI: 10.1016/j.surfcoat.2017.08.033

Optimization of nanocomposite Au/TiO2 thin films towards LSPR optical-sensing, M. S. Rodrigues, D. Costa, R. P. Domingues, M. Apreutesei, P. Pedrosa, N. Martin, V. M. Correlo, R. L. Reis, E. Alves, N. P. Barradas, P. Sampaio, J. Borges, and F. Vaz, Applied Surface Science (2017) accepted manuscript; DOI:. 10.1016/j.apsusc.2017.09.162

Characterization of magnetron sputtered sub-stoichiometric CrAlSiN and CrAlSiON coatings, A. Al-Rjoub, P. Costa, L. Rebouta, M.F. Cerqueira, P. Alpuim, N.P. Barradas, E. Alves, Surface and Coatings Technology, 328 (2017) 134-141; http://hdl.handle.net/1822/48540

Chitosan patterning on titanium implants (2017)Gilabert-Chirivella, E., Pérez-Feito, R., Ribeiro, C., Ribeiro, S., Correia, D.M., González-Martín, M.L., Manero, J.M., Lanceros-Méndez, S., Ferrer, G.G., Gómez-Ribelles, J.L. Progress in Organic Coatings, 111, pp. 23-28. DOI: 10.1016/j.porgcoat.2017.04.027

Comparative study of surface properties determination of colored pearl-oyster-shell-derived filler using inverse gas chromatography method and contact angle measurements (2017) Yao, Z., Wu, D., Heng, J.Y.Y., Lanceros-Méndez, S., Hadjittofis, E., Su, W., Tang, J., Zhao, H., Wu, W. International Journal of Adhesion and Adhesives, 78, pp. 55-59. DOI: 10.1016/j.ijadhadh.2017.06.018

Concentrated solar energy used for sintering magnesium titanates for electronic applications, Irina Apostol, Jose Rodríguez, Inmaculada Cañadas, Jose Galindo,Senen Lanceros Mendez, Pedro Libânio de Abreu Martins, Luis Cunha,Kandasamy Venkata Saravanan, in press Applied Surface Science (2017), doi.org/10.1016/j.apsusc.2017.09.224 http://hdl.handle.net/1822/47651

Corrosion Behavior of Titanium Oxynitrided by Diffusion and Magnetron Sputtering Methods in Physiological Solution, I. Pohrelyuk, O. Yaskiv, O. V. Tkachuk, N. P. Barradas, E. Alves, F. Vaz, L. Cunha, Materials Performance and Characterization, Vol. 6, No. 4, 2017,pp. 1–13, https://doi.org/10.1520/MPC20160074.

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6.3.4.2 Books and book chapters

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6.3.5.1 Invited talks delivered at Conferences (International/National)

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Deposition of Fluor-doped WS2-C Coatings on nanostructured Anodized Aluminum alloy substrates for Wettability control, S. Rodrigues, S. Carvalho, A. Cavaleiro, 44th International Conference on Metallurgical Coatings and Thin Films (ICMCTF2017), San Diego, CA. USA, 24-28th April, 2017.

Nanostructured Surfaces based on Tantalum Oxide for Osseointegrated Metallic Implants,C.F. Almeida Alves, J. Oliveira, S. Pires, L. Marques, D. Scheneider, A. Cavaleiro, S. Carvalho, 44th International Conference on Metallurgical Coatings and Thin Films (ICMCTF2017), San Diego, CA. USA, 24-28th April, 2017.

Ag-ZrCN coatingsas a solution for improving the eletrochemicaç and tribological performance of biomaterials, S. Calderon V; J.C. Sánchez-López, A. Cavaleiro; S.Carvalho, 6th European Conference on Tribology, ECOTRIB 2017, 7-9 june, 2017, Ljubliana, Solvenia.

Friction of Structured Tantalum Surfaces by Anodization,Ayesha Khalid, C. F. Almeida Alves, A. Ramalho, Sandra Carvalho, A. Cavaleiro IBERTRIB 2017 – IX Iberian Conference on Tribology, 12-13 june 2017, University of Minho, Guimarães, Portugal

Zinc and Zinc-Iron Nanoparticles as Oxygen Scavengers, S. Calderon V., P. J. Ferreira, S. Carvalho, EUROMAT 2017, European Congress and Exhibition on Advanced Materials and Processes,17-22 september 2017, Thessaloniki, Greece

Ink jet printing: Basics, technique, inks and electronic devices'' Eloi Ramon (ICAS CNM, Barcelona, Spain) & Senentxu Lanceros-Mendez (BCMaterials, Spain and Univ. Minho, Braga, Portugal). Invited course at the MNE-2017 43er International Meeting on Micro and Nanoengineering meeting, September 2017, Braga, Portugal

Electroactive microenvironments for tissue engineering applications. C. Ribeiro, S. Ribeiro, D.M. Correia, I. Etxebarria, N. Castro, V. Correia and S. Lanceros-Méndez, International Symposium on Materials for Tissue Engineering; November 9th 2017 Bilbao, Spain.

Printing smart and functional polymers for sensor and actuator applications", Techconnect, May 13/5-17/5/2017, Washington, USA

Advanced technologies based on smart-polymer nanocomposites" P. Martins, S. Lanceros-Mendez, 27/3-29/3/, European Hengstberger Symposium New Horizons in Smart Materials, Heidelberg, Germany.

The key role of smart and functional materials in the development of modern technology" S. Lanceros-Mendez; The Vanguard Lecture, 20th February 2017; IIT Jodhpur, India

Advanced polymer based materials: from fundamentals to applications.... and back to fundamentals" S. Lanceros-Mendez, Invited seminar, University of Jadavpur, 02/2017

Multifunctional polymer composites: expanding their applicability by tuning shape and response", D. M. Correia, C. Ribeiro, V. F. Cardoso, P. Martins, S. Lanceros-Méndez, 6th International Conference on Functional Electroceramics and Polymers, 20th-22th February, 2017, IIT Kharagpur, India

Optimization and integration of multifuctional polymer based materials: challenges and trends" S. Lanceros-Mendez, XIII Meeting of the Institute of Materials of Alicante (IUMA) 19-20/1/2017, Alicante, Spain

Production of zirconium oxynitride thin films by magnetron sputtering: the quest of breaking the chemical composition and colour restrictions,C.I. DA SILVA OLIVEIRA, D. MARTINEZ-MARTINEZ, L. CUNHA; E. ALVES, N.P. BARRADAS, M. APREUTESEI, International Conference on materials Science and Engineering (BRAMAT 2017), in Brasov, Romania (8-11 March 2017)

High temperature solar thermal systems, L. Rebouta, Workshop on emerging technologies for Energy, 18-20 December 2017, Porto

Production of zirconium oxynitride thin films by magnetron sputtering: the quest of breaking the chemical composition and colour restrictions. C.I. da Silva-Oliveira, D. Martinez-Martinez, L. Cunha, E. Alves, N.P. Barradas, M. Apreutesei. 10th International Conference on Materials Science and Engineering (BRAMAT 2017), Brasov (Romania). 8-11 March 2017 (Keynote Oral).

TopoSEM: a novel tool to measure topography from SEM images in a simple way. D. Martinez-Martinez, C. Mansilla, E.T. Faber, J.Th.M. de Hosson. 10th Symposium on Vacuum based Science and Technology, Kolobrzeg (Poland). 28-30 November 2017 (Invited presentation).

National

Criatividade no Ensino das Ciências nos Primeiros Anos Manuel Filipe Costa – 6.º Seminário de Matemática e Ciências Experimentais, ESEL-IPL, Lisboa, July 4, 2017. Plenary lecture.

Leather functionalized with antimicrobial nanoparticles, Carvalho, S. Ferdov, M.A. Cerqueira, L.M. Pastrana, M. Henriques, C. Gaidau, S. Carvalho, MATERIAIS 2017-XVIII Congresso da Sociedade Portuguesa de Materiais and VIII International Symposium on Materials, Aveiro, Portugal, 9-12th April 2017

6.3.5.2 Contributed talks delivered at Conferences (International/National)

International

Design of selective solar absorber for high temperature applications,AL-Rjoub, 9th International conference on Advanced Nanomaterials, AMN17, 19-21 July, 2017, Aveiro

Optical properties of Au/CuO nanoplasmonic thin films, J. Borges, R. M. S. Pereira, M. Proença, M. S. Rodrigues, M. I. Vasilevskiy and F. Vaz, III International Conference on Applications in Optics and Photonics (AOP 2017), 8-12 May 2017, Faro, Portugal (International conference; oral).

Optimization of Au/TiO2 thin films towards optical (bio)sensing", M.S. Rodrigues, J. Borges, D. Costa, R.P. Domingues, P. Sampaio, M. Apreutesei, P. Pedrosa, N. Martin, E. Alves, N. Barradas, P. Sampaio, F. Vaz,

10th International Conference on Materials Science and Engineering – BRAMAT 2017, Brasov, Romania, March 8 - 11, 2017. Oral.

GLAD co-sputtering of bi-component nanostructured TiAg and TiCu thin films for high TCR sensors", Paulo Pedrosa, Armando Ferreira, Nicolas Martin, Mohammad Arab Pour Yazdi, Alain Billard, Filipe Vaz, E-MRS 2017 Spring Meeting, May 22-26, Congress Center - Strasbourg, France. Oral.

In situ study of the mechanical behavior of PVD thin metallic films for biomedical applications deposited on PET substrates", A. Etiemble, G.I. Nkou Bouala, C. Lopes, C. Langlois, B. Freitas, M.S. Rodrigues, J. Rethoré, J.F. Pierson, F. Vaz, P. Steyer, E-MRS 2017 Spring Meeting, May 22-26, Congress Center - Strasbourg, France. Oral.

Optical microtopographic inspection of asphalt pavement surfaces, Manuel F. M. Costa; E. F. Freitas; H. Torres; V. Cerezo, Proc. SPIE 10453, Manuel F M Costa Ed., pp 1045303-1 to 1045303-9 (2017); doi: 10.1117/12.2270880

3D Characterization of Arqueological Ceramics,Manuel F. M. Costa, Wagner Magalhaes, Márcia Angelina Alves, Technoheritage 2017, Cadiz, Spain, May 21-24, 2017.

Roughness and microtopographic inspection in dentistry, M F M Costa, P B Pereira, 2017' International Workshop on Materials Science and Mechanical Engineering (IWMSME 2017), Kunming, Yunnan, China, October 27th -29th, 2017. IOP Conference Series: Materials Science and Engineering Online ISSN: 1757-899X Print ISSN: 1757-8981 (1st quarter 2018)

A SYSTEMATIC STUDY OF THERMAL PROPERTIES OF ZR-O-N THIN FILMS USING IR RADIOMETRY, Francisco Macedo; Catarina Oliveira; Diego Martinez; Luís Cunha, 19th International Conference on Photoacoustic and Photothermal Phenomena. Bilbao. July 16-20, 2017

Photocatalytic Asphalt Mixture: Influence of Temperature, Spraying Rate and Incorporation Percentage of TiO2", Rocha Segundo, I.G; Oliveira, S, Freitas; E, Carneiro, J; Landi, S. 4th Photocatalytic and Superhydrophilic Surfaces Workshop, 7th/8th December 2017, Manchester (UK).

Substrate influence on the tribological behaviour of DLC coatings with CrN interlayer deposited on hardened steel, D. FELDIOREAN, D. CRISTEA, M. TIEREAN, C. GABOR, D. MUNTEANU, L. JAKAB-FARKAS, L. CUNHA, N.P. BARRADAS, E. ALVES, M. SOCOL, D. CRACIUN, International Conference on materials Science and Engineering (BRAMAT 2017), in Brasov, Romania (8-11 March 2017)

Green strategies for the development of printable polymer based piezoresistive sensors,J. Oliveira, B. F. Gonçalves, P. Costa, V. Correia, G. Botelho, S. LancerosMendez, 2017 TechConnect World Innovation Conference, Washington DC, USA, 14-17 May, 2017;

Printed organic photodetectors for x-ray indirect radiation detection, J. Oliveira, E. Sowade, V. Correia, K. Y. Mitra, I. Etxebarria, G. Rocha, R.R. Baumann, S. Lanceros-Mendez, 2017 MRS Fall Meeting & Exhibit, Boston, Massachusetts, November 26 – December 1, 2017.

Piezo and magnetoelectric polymers as biomaterials for tissue engineering applications, Ribeiro, D.M. Correia, S. Ribeiro and S. Lanceros-Mendez, Materials Research Society conference, November 26-December 1 2017, Boston, USA.

Poly(vinylidene fluoride)/ionic liquid electrospun fibers and microspheres for tissue engineering applications. D.M. Correia, S. Ribeiro, C. Ribeiro, M. Tariq, JM.S.S. Esperança, S. Lanceros-Mendez. 9th International Conference on Advanced Nanomaterials (ANM2017), July 19-21 2017, Aveiro, Portugal.

Development Of Printed Interactive Surfaces Based On Electroactive Polymers, N. Castro, S. Gonçalves, J. Serrado Nunes, N. Pereira, V. Correia, S. Lanceros-Mendez. Printed and Flexible Electronics Congress, 21st-22nd Feb 2017, London, UK.

Development of tissue engineering strategies based on piezoelectric polymers", Kock-off meeting of the "Piezoelectric biomaterials for cell differentiation in electrically active cell-material interfaces" project at the Center of Biomaterials of the Polytechnical University of Valencia, SpainS. Lanceros-Mendez; 18/01/2017

Gold nanoisland-decorated TiO2 for enhanced photocatalysis, P.M. Martins, Sandro Kapert, Le Nga, K. Kühn, G. Cuniberti, V. Sebastian and S. Lanceros-Méndez, "Materiais 2017", 9-12 April 2017, University of Aveiro (Portugal)

Comparative effects of metallic nanoparticles on microbes and invertebrates involved in plant litter decomposition in streams, Fernandes M, Pradhan A, Pascoal C, P.M. Martins, Lanceros-Mendez S, Cássio F, Conference on Plant Litter Processing in Freshwaters, 17-20 July 2017, Bilbao (Spain)

Degradation of tartrazine pollutant under solar irradiation using TiO2 immobilized into P(VDF–TrFE) membrane, L. Aoudjit, P.M. Martins, F. Madjene, B. Boutra, and S. Lanceros-Mendez, Séminar National sur la Chimie des Matériaux, (SNCM), 24-25 April 2017

Fabrication and characterization of a DC magnetic field sensor based on magnetoelectric polymer composites", Marco P. Silva, Sílvia Reis, Nelson Castro, Vitor Correia, José G. Rocha, Pedro Martins and Senentxu Lanceros-Mendez, Materiais 2017, Aveiro, Portugal, 9 de Abril a 12 de Abril de 2017

Photocatalytic activity of TiO2/graphene and TiO2/graphene oxide nanocomposites, C.G. Ferreira, P.M. Martins, A.R. Silva, M. Melle-Franco, Paula A. A. P. Marques, M.M. Alves, L.Pereira, S. Lanceros-Méndez, Intenational Materials Conference, "Materiais 2017", 9-12 April 2017, University of Aveiro (Portugal)

Piezo and magnetoelectric polymers as biomaterials for tissue engineering applications, Ribeiro, D.M. Correia, S. Ribeiro and S. Lanceros-Mendez, Materials Research Society conference, November 26-December 1, 2017; Boston, USA.

Development of a polymer based capacitive screen printed touchpad". Oral presentation in the conference N. Castro; S. Gonçalves, J. Serrado Nunes; N. Pereira; V. Correia; S. Lanceros- Mendez "ANM 2017", from 19 to 21 of July of 2017, Aveiro, Portugal.

Development of a capacitive touch sensor based on Anodic Aluminum Oxide (AAO) nanostructures", F. Machado, J.O. Carneiro, M. Pereira, S. Lanceros-Mendez, F. Fernandes, A.P. Samantilleke, V. Teixeira.

NanoPT 2017 – International Conference on Nanoscience and Nanotechnology, January 01-03, 2017, Porto (Portugal).

Influence of vicoelasticity on the frictional performance of DLC-coated elastomers. D. Martinez-Martinez, J.Th.M. De Hosson. European Materials Research Society (E-MRS) Spring Meeting 2017, Strasbourg (France). 22-26 May 2017 (Oral).

Structural and dielectric properties of laser annealed multiferroic nanostructures", J.R. Alves, J. Oliveira, A.G. Rolo, J.A. Mendes, E.Venkata Ramana, M.P.F.Graça, M.A. Valente, B.G. Almeida, comunicação oral apresentada no "VIII International Symposium on Materials", Aveiro, 9-12 abril, 2017

Influence of vicoelasticity on the frictional performance of DLC-coated elastomers. D. Martinez-Martinez, J.Th.M. De Hosson. 9th Iberian Conference on Tribology (IBERTRIB 2017), Guimaraes (Portugal). 12-13 June 2017 (Oral).

National

Photocatalytic degradation of Rhodamine B dye using SiO2-TiO2nano supported in HY zeolite on the cotton textiles", Salmon Landi Jr., Joaquim Carneiro, Pier Parpot, Maurício Fonseca, Isabel Neves. Materiais 2017, 09-12 April 2017, Aveiro (Portugal).

Functionalized Asphalt Mixtures: Photocatalytic, Superhydrophobic and Self-cleaning Properties", Rocha Segundo, I.G; Ferreira, C; Freitas, E; Carneiro, J; Fernandes, F; Landi, S. DCE 2017 - 2nd Doctoral Congress in Engineering, 08-09 June 2017, Porto (Portugal).

Micro - e Nanofibras multiferróicas preparadas por electrospinning ", V. Gomes, E. Gomes, BG Almeida, Dia Mundial dos Materiais, Univ. Beira Interior, Covilhã, 8 Nov., 2017

Microfluidic technology as efficient strategy for the automated and effective cleaning of magnetic entities, V. F. Cardoso, D. Miranda, G. Botelho, G. Minas, S. Lanceros-Mendez, ANM 2017. 19-21 July 2017, Aveiro, Portugal.

Development of polymer-based printable devices, 30/4-3/5/2017, MODEST "Polymers, Environment & Sustainable Developments and Opportunities", J. Oliveira, B. F. Gonçalves, P. Costa, V. Correia, G. Botelho and S. Lanceros-Mendez, Algarve, Portugal

Electrospun magnetic silk fibroin composite for tissue engineering applications. R. Brito-Pereira, S. Ribeiro, D.M. Correia, C. Ribeiro, G. Botelho, S. Lanceros-Mendez. Modest worshop 2017, Albufeira, April 30th - May 3rd 2017, Albufeira, Portugal.

Effect of poling state of piezoelectric poly(vinylidene fluoride) films on C2C12 myoblast differentiation for skeletal muscle tissue engineering. S. Ribeiro, C. Ribeiro, A.C. Gomes, S. Lanceros-Méndez. Materiais, Aveiro, April 9-12, 2017, Aveiro, Portugal.

Printable Piezoresistive Sensor Matrix For Interactive And Biomedical Applications. N. Castro; J. Serrado Nunes; S. Gonçalves; N. Pereira; P. Costa; V. Correia; S. Lanceros-Mendez. ANM 2017, 19 -21 July, Aveiro Portugal

Environmental friendly screen-printed electrodes for printed lithium-ion batteries Gören, J. Mendes, H. M. Rodrigues, R. E. Sousa, J. Oliveira, Loic Hilliou, C. M. Costa, M. M. Silva, S. Lanceros-Méndez, Materiais 2017, 9-12 April 2017, Aveiro, Portugal

6.3.5.3 Conference organization (International/National)

International

Asian Advanced Materials Congress (ASAMC) 2017. Joaquim Carneiro, member of the advisory/organizing committee of Diamond Princess Cruise, Singapore, 11-16 March 2017.

International Conference on Mechanical Design and Electronic Engineering 2017Joaquim Carneiro, member of the technical program committee of (MDEE2017) 2017. August 18th-20th, 2017 in Guilin, China.

III International Conference on Applications in Optics and Photonics (AOP2017), Joaquim Carneiro: member of the Program Committee of May 8-12, 2017, Faro, Portugal.

AOP2017 (185)Manuel Filipe Costa

HSCI2017 (200)Manuel Filipe Costa

Functional coatings, EUROMAT 2017,Sandra Carvalho - Chair: Tutorial: Thessaloniki, Greece, from 17th – 22nd September, 2017

Seminar on Nanotecnology: science, companies and society, Sandra Carvalho – Organizer – at INL, 13rd December, 2017

Symposium on "Thin films / coatings tribology", Sandra Carvalho - Chair: SurfCoat Korea 2018, The International Conference on Surfaces, Coatings and Interfaces, Incheon, Korea, from the 28th to the 30th March, 2018

International Scientific Committee, CNMAT - Sandra Carvalho - Membro Salamanca 2018, XIV Congreso Nacional de Materiales, Salamanca, Spain, July 2018.

International Scientific Committee, PSE2018 – Sandra Carvalho - Membro 16th International Conference on Plasma Surface Engineering, Garmisch-Partenkirchen, Germany, September 2018

E-MRS 2017 symposium Q, F. Vaz, organizer

Special Issue Managing Guest Editor for Surface and Coatings Technology within the frame of E-MRS 2017 symposium Q ,F. Vaz, organizer

Functional coatings, EUROMAT 2017, Thessaloniki, Sandra Carvalho - Chair: Tutorial:Greece, from 17th – 22nd September, 2017

Symposium on "Thin films / coatings tribology", SurfCoat Korea 2018, Sandra Carvalho - Chair: The International Conference on Surfaces, Coatings and Interfaces, Incheon, Korea, from the 28th to the 30th March, 2018

CNMAT - Salamanca 2018, XIV Congreso Nacional de Materiales, Sandra Carvalho - Membro do International Scientific Committee, Salamanca, Spain, July 2018.

PSE2018 – 16th International Conference on Plasma Surface Engineering, Sandra Carvalho - Membro do International Scientific Committee, Garmisch-Partenkirchen, Germany, September 2018

Advances in Materials & Processing Technologies Conference 2017,Martin Andritschky, Steering committee realizado VIT University Chennai, India 11... 14 de Dezembro 2017

3rd International Conference on Applications of Optics and Photonics, Manuel Filipe Costa – Chairperson, AOP2017, Faro, Portugal, May 8 – 12, 2017

V Internacional Symposium of University Teaching (CINDU 2017), Manuel Filipe Costa – member of the Scientific Committee, Vigo, Spain, June 15 – 17, 2017.

International Technical Program Committee, 2017 International Workshop on Materials Science and Mechanical Engineering (IWMSME 2017), Manuel Filipe Costa – member of the Editorial Board and member of the Kunming, Yunnan, China, October 27th -29th, 2017.

5th International Conference on Photonics, Optics and Laser Technology" - PHOTOPTICS 2017, Porto, Portugal, February 27 to March, 2017 Manuel Filipe Costa – member of the Program Committee,

Global Summit on Laser Optics & Photonics (Optics-2017), Valencia, Manuel Filipe Costa – member of the Organizing committee, Spain, June 19-21, 2017.

ETOP 2017, the 14th International Conference on Education and Training in Optics and Photonics, Manuel Filipe Costa – member of the Program Committee Hangzhou, China, May 29-31, 2017.

5th International Conference on Optical and Photonic Engineering - icOPEN2017, Manuel Filipe Costa – member of the International Advisory Board,Singapore, April 5 – 7, 2017

4th International Conference on Management Science and Management Innovation (MSMI 2017), Manuel Filipe Costa – member of the Technical Program Committee, Suzhou, China, June 23-25, 2017.

International Conference on Energy Development and Environmental Protection (EDEP 2017), Guilin, Guangxi, Manuel Filipe Costa – member of the Technical Program Committee, China, August 18-20, 2017.

2nd International Conference on Digital Pathology & Image Analysis, San Antonio, USA, November 15-16, 2017.Manuel Filipe Costa – member of the Organising Committee,

10th INTERNATIONAL CONFERENCE ON MATERIALS SCIENCE & ENGINEERING, BRAMAT 2017, BRASOV - ROMANIA, 8-11 março, 2017.Cacilda Moura, Luis Cunha International Advisory Committee-

International Conference on Phenomena in Ionized Gases ICPIG 2017 – Lisboa 9 – 14 de July de 2017 (300 attendees).Luís Marques – Local Organizing comittee

III International Conference on Applications in Optics and Photonics AOP 2017 , Faro 8 – 12 May 2017 (150 attendees).Luís Marques – Scientific committee

Nanoscience with Nanocrystals, NANAX VIII, Braga, Portugal, July 3-7, 2017.Manuel Filipe Costa – member of the Local Organising Committee,

14th International Conference on Hands-on Science, Manuel Filipe Costa – Chairperson, HSCI2017, Braga, Portugal, July 10 - 14, 2017.

National

Seminar on Nanotecnology: science, companies and society, at INL, Sandra Carvalho – Organizer – 13rd December, 2017

VipIMAGE 2017 - VI ECCOMAS Thematic Conference on Computational Vision and Medical Image Processing, Manuel Filipe Costa – member of the Scientific Committee, Porto, Portugal, October 18-20, 2017.

6.3.6 Supervision of Research Students

6.3.6.1 PhD projects completed in 2017

Author	Supervisor	Title	Situation
Diego Martinez-Martinez (2nd PhD)	J. Th. M De Hosson, University of Groningen (Netherlands). Luís Cunha, Physics Department, University of Minho (Portugal)	Protection of Elastomers with DLC films – Deposition, Characterization and Performance	Institution: University of Groningen (Netherlands),
Rita Rebelo	Raúl Fangueiro, Sandra Carvalho e Mariana Henriques	Hybrid Braided Stent with Antimicrobial Properties	EEUM
Attila Gören	Professor Maria Manuela da Silva	Development of new electrode films for lithium-ion rechargeable batteries	PhD in Science, Physics

	Pires da Silva; Professor Senentxu Lanceros-Méndez		
Ricardo Estrada Sousa	Professor Senentxu Lanceros-Méndez and Maria Manuela da Silva Pires da Silv	Polymer based materials for printed batteries	PhD in Science, Physics
Silvia Reis	Profs. Gerardo Rocha; S. Lanceros-Mendez, P. Martins	Development and characterization of sensors fabticated from polymer based magnetoelectric nanocomposites	PhD pogramm in Electronics Engineering
Daniel Miranda	M. Alneida, S. Lanceros-Mendez, Manuela Silva	Optimizing performance of rechargeable lithium-ion batteries through computer simulations	PhD in Science
Vânia Cristina Gonçalves Pinto	Graça Maria Henriques Minas, Margarida Correia-Neves, Senentxu Lanceros-Méndez	Imunossensor microfluídico para quantificação de cortisol salivar	PhD programm in Biomedical Engineering
Renato Gonçalves	Senentxu Lanceros-Méndez, Gabriela Botelho;	High performance magnetoelectric nanocomposite morphologies for advanced applications	PhD programm in Materials Science
Rania MEJRI	Salma Besbes Hentati, Senentxu Lanceros Mendez	Ionic Electroactive Polymers for Sensor and Actuator Applications	
Paulo Jorge Teixeira de Sousa	Graça Maria Henriques Minas, Senentxu Lanceros-Méndez	Matriz de sensores em filme fino para medição da pressão no trato gastrointestinal	PhD programm in Biomedical Engineering
Gabriel Pinto Mendes	Senentxu Lanceros-Méndez, Leonardus Kluskens, Manuel Mota	Tribos transformation of Escherichia coli JM109	EEUM
Vitor Vasconcelos	Jorge Pacheco/ Marta Ramos	Emergence and Self-organization of Cooperation	ECUM

6.3.6.2 PhD projects in progress

Author	Supervisor	Title	Situation
Al-Rjoub, Design	L.Rebouta, S. Lanceros Mendez	fabrication, characterization and aging studies of selective solar selective absorber surfaces	MAPFIS doctoral program
Cláudia de Jesus Ribeiro Lopes	José Filipe Vilela Vaz	Advanced thin film architectures for enhanced biomedical sensing performance	ECUM
Cristiana Alves	Sandra Carvalho	Desenvolvimento de superfícies bioativas para o crescimento ósseo em implantes dentários	Programa Doutoral em Engenharia de Materiais da Universidade do Minho
Salmon Landi Júnior	Joaquim Carneiro Pierre Parpot	Tratamento de efluentes industriais através de processos fotocatalíticos com dióxido de titânio	Doutoramento em Ciências, Universidade do Minho, Escola de Ciências -

Iran Gomes da Rocha Segundo	Elisabete Freitas Joaquim Carneiro	Incorporação de nanomateriais em misturas asfálticas ecológicas (recicladas e mornas) destinadas à camada de rolamento para sua funcionalização	Doutoramento em Engenharia Civil, Universidade do Minho, Escola de Engenharia -
Simone Rodrigues	Orientador: Albano Cavaleiro, Co-orientador: Sandra Carvalho	Development of hidrophilic / oleophobic treatments for self-cleaning anti-greasy surfaces	InPrograma Doutoral em Engenharia Mecânica da Universidade de Coimbra
Rita Ferreira	Orientador: Filipe Samuel Siva Co-orientador: Sandra Carvalho	New processing technologies for improved compression piston rings performance	Leaders for Technical Industries Doctoral Program
Edgar Carneiro	Orientador: Sandra Carvalho	Desafios REACH: revestimentos alternativos ao Cr hexavalente	Doctoral Program on Surface and Protection Engineering e inscrito Programa Doutoral em Engenharia de Materiais da Universidade do Minho
Luísa Fialho	Orientador: Sandra Carvalho, Co-orientador: Maria Helena Fernandes (U. Porto)	Design of new biocompatible osseointegrated implants	Doctoral Program on Surface and Protection Engineering e inscrito Programa Doutoral em Engenharia de Materiais da Universidade do Minho
Diogo Cavaleiro	Orientador: Sandra Carvalho, Co-orientador: Filipe Fernandes (U. Coimbra)	The importance of Ag content for optimizing the machining performance of Ti-Si-(Ag)-N coatings	Doctoral Program on Surface and Protection Engineering e inscrito Programa Doutoral em Engenharia de Materiais
Veniero Lenzi	Supervisor: Luís Marques	Simulation of phase structured polymer composites	Doutoramento em Ciências (ECUM) -
Marcelo José Silva Oliveira	Supervisors: José Pedro Basto da Silva e Mario A. C. Castro Pereira	Produção e caracterização de filmes finos ferroeléctricos com nanopartículas metálicas incorporadas para aplicações na microelectrónica	School of Sciences – School of Engineering, UM., Beginning September 2016.MSc. MIEMAT
António José Castro	Supervisor: Luís Marques	Prog. Dout. Engª Materiais (ECUM)	Doctoral Program on Surface and Protection Engineering e inscrito Programa Doutoral em Engenharia de Materiais
Rafael Monteiro	Supervisors: José Pedro Basto da Silva e Mario A. C. Castro Pereira,	Nanoestruturas plasmónicas para biossensores à base do efeito de superfície de dispersão reforçada de Raman (SERS)	School of Sciences – School of Engineering,
João Braga da Silva	Supervisors: José Pedro Basto da Silva e Mario A. C. Castro Pereira	Estruturas ferroelétrico/dielétrico para dispositivos de memória	School of Sciences – School of Engineering, UM.

Maria Lúcia Miranda Gomes	Paulo J. G. Coutinho; Cacilda Moura	SERS nanotags based on gold or silver nanoparticles decorating superparamagnetic calcium ferrite nanoparticles	ECUM
Pedro Miguel Coxixo Xarepe	Paulo J. G. Coutinho; Cacilda Moura	SERS substrates based arrays of gold nanoparticles for bioanalysis / Matrizes baseadas em substratos SERS de nanopartículas de ouro para bioanálise	ECUM
Filipe da Costa Correia	Carlos Tavares, Adélio Mendes (UPorto)	Desenvolvimento de filmes finos heteroestruturados de ZnO com propriedades termoelétricas, para aplicação em células solares	EEUM
Juliana Filipa Gouveia Marques	Carlos Tavares	Difusão controlada de compostos ativos do interior de microcápsulas mediada por ativação solar	EEUM
Marco Pires Sampaio Martins Rodrigues	Supervision: José Filipe Vilela Vaz and Joel Nuno Pinto Borges, ECUM.	Nano-designed LSPR thin films using GLAD in reactive magnetron sputtering, for optical sensing	PhD in Physics MAP-Fis
Jivago Nunes	S. LancerosMendez	Polymer based sensors fabricated by printing technologies	EEUM
Juliana Dias	S. LancerosMendez	Radiation detectors based in inkjet printing technologies	ECUM
Juliana Oliveira	S. LancerosMendez	Radiation detectors based in inkjet printing technologies	EEUM
Pedro Martins	S. LancerosMendez	New generation of photocatalytic nanocomposites: production, characterization and environmental application	ECUM
Sofia Ferreira	Rodrigo Martins, Luis Rebouta,	Multifunctional metal oxides semiconductor presenting simultaneously transparency, conductivity and luminescent properties – Luminescent-TCOs	New University of Lisbon/UM
Marta Forte	Carlos Tavares	Encapsulation of phytonutrients in polymeric microcapsules coated with photocatalytic nano materials (PCNM)	UM/Aveiro
Ana Catarina Branco Lima	Pedro Libânio Martins (UM), Yury Kolen'ko (INL), Senentxu L. Mendez (UM/BC Materials)	Development, optimization and "green" printing of inks for electronic components and sensing devices	ECUM
Bruna Gonçalves	Senentxu Lanceros-Méndez (UM); Yury Kolen'ko (INL) e Gabriela Botelho (UM)	Printable photovoltaic systems based on Cu(In,Ga)Se2 chalcopyrite	ECUM
Hugo Salazar	Stanislav Ferdov (UM), Senentxu Lanceros Mendez	New generation of polymer composite membranes for water purification	ECUM

	(UM), Gabriela Botelho (UM)		
Sylvie Ribeiro	Senentxu L. Mendez (UM), Andreia Gomes (UM), Carlos Baleizão (Instituto Superior Técnico)	Tailoring electroactive polymer nanocomposites for novel muscle tissue engineering applications	ECUM

6.3.6.3 MSc projects completed in 2017

Author	Supervisor	Title	Situation
Clara Catarina Pereira Gonçalves	Carlos Tavares and Rosa Bessada ,	(ZF/TRW)Funcionalização de tecidos airbag com microcápsulas para absorção de impacto	EEUM
Filipe da Silva Machado	Joaquim Carneiro Mário Pereira	Desenvolvimento de um sensor de toque capacitivo usando estruturas anódicas nanoporosas de óxido de alumínio (AAO)	Mestrado em Engenharia de Materiais, Universidade do Minho, Escola de Engenharia
João Pedro Costeira Vieira	Orientador: Joaquim Carneiro Co-orientador: Vasco Teixeira	Desenvolvimento de um kit didáctico de energia solar fotovoltaica	Mestrado em Ciências e Tecnologias do Ambiente, Universidade do Minho, Escola de Ciências
Sérgio Manuel Batista Oliveira	Elizabete Freitas Co-orientador: Joaquim Carneiro	Avaliação do Impacto da Água e do Tráfego nas Capacidades Fotocatalítica e Autolimpante de Misturas Betuminosas Funcionalizadas com TiO2	Mestrado em Engenharia Civil, Universidade do Minho, Escola de Engenharia
Filipe Machado	Joaquim Carneiro, Mario A. C. Castro Pereira	Desenvolvimento de um sensor de toque capacitivo usando estruturas anódicas nanoporosas de óxido de alumínio (AAO)	MSc. MIEMAT School of Sciences ECUM – School of Engineering EEUM, UM.
Reza Bayat ,	Albano Cavaleiro (U. Coimbra) Co-orientadora: Sandra Carvalho,	Corrosion and Tribocorrosion response of Ta based coatings in artificial saliva	TRIBOS – Joint European Master in tribology of surfaces and interfaces - University of Coimbra
Joana Oliveira	Sandra Carvalho Co-orientadores: Sebastian Calderon Velasco	Deposição de nanopartículas de ZnO em nanoestruturas de Ta	Mestrado Integrado em Engenharia de Materiais

Sara Pires,	Sandra Carvalho Co-orientadores: Cristiana Alves (estudante de Dutoramento)	Incorporação de Ca, P e Mg em óxido de tântalo anódico nanoestruturado: caracterização da biocompatilibidade e citotoxicidade	Mestrado Integrado em Engenharia de Materiais
Liliana Fernandez	Marlene Lucio	Development of polymer encapsulated magnetic nanoparticles for biomedical applications	Biophysics and Bionanosystems
Joana Ribeiro	Senen Lanceros Mendes Luciana Pereira (DEB)	Photocatalytic degradation of micropollutants with TiO2/PVDF-TrFE membranes	Physics
Catarina Ferreira	Senen Lanceros Mendez	Modeling of photocatalysts for photocatalytic applications	Physics
Margarida Cautela	Paulo Coutinho Senen Lanceros Mendez	Biosensor devices based on the association of biomolecules with gold surfaces	Biophysics and Bionanosystems
Marta Fernandes		Avaliação da toxicidade das nanopartículas de dióxido de titânio, dióxido de titânio dopado com erbium e ferrites de cobalto em fungos aquáticos	Environmental Science and Technology
Sandro Kappert		Synthesis and characterization of a TiO2/Au nanocomposite for degradation of ciprofloxacin in water	TU Dresden
Pedro Dias		Efficient and environmental friendlier cathodes for Li-ion batteries	Environmental Science and Technology.
Tiago Marinho	Senen Lanceros Mendez	Design of polymer-based magnetoelectric microstructures for applications in miniaturized biomedical systems	Physics
João Barbosa		Ionic liquids in membrane separators for battery applications	Environmental Science and Technology.
Miguel Fernando Silva Castro Neves Barbosa		Instrumentalização de um endoscópio através de sensores piezorresistivos impressos	Electronics Engineering.
Rafael Carvalho Martins		Desenvolvimento de um biorreator magnético para estudos em engenharia de tecidos	Electronics Engineering
João Pedro Costeira Vieira	Joaquim Carneiro Vasco Teixeira	Desenvolvimento de um kit didáctico de energia solar fotovoltaica	Mestrado em Ciências e Tecnologias do Ambiente, Universidade do Minho, Escola de Ciências
Sérgio Manuel Batista Oliveira Título:	Elizabete Freitas Joaquim Carneiro	Avaliação do Impacto da Água e do Tráfego nas Capacidades Fotocatalítica e Autolimpante de Misturas Betuminosas Funcionalizadas com TiO2	Mestrado em Engenharia Civil, Universidade do Minho, Escola de Engenharia
Rui Pedro Pereira Domingues	Supervision: José Filipe Vilela Vaz	Desenvolvimento de filmes finos coloridos constituídos por nanopartículas metálicas (Au, Ag, Cu) dispersas numa matriz dielétrica	Integrated Master in Materials Engineering, EEUM.

	and Joel Nuno Pinto Borges		

7 Appendix

7.1 PhD students – members of other R&D Centres, co-supervised by CFUM reseachers and Part-Time PhD students

1. George Luiz Machado Jr. – Material Engeneering Phd Program – CAPES Fellowship
2. Gonçalo Catarina MAP-Fis
3. Helena Isabel Ferreira Neves - Science Phd Program – FCT Fellowship
4. Maria Francisca Pinto e Peixoto - OCV Phd Program
5. Patrícia Daniela Cabral da Silva - MAP-Fis FCT Grant
6. Paulo Sousa - Engeneering Phd Program – FCT Fellowship (defended 2017)
7. Pedro Martins - Science Phd Program – FCT Fellowship
8. Ramya Gummadi – Map-Fis
9. Renato Gonçalves - Engeneering Phd Program – FCT Fellowship (Defended 2017)
10. Rita Ferreira - Engeneering Phd Program – FCT Fellowship
11. Rita Rebelo - Engeneering Phd Program – FCT Fellowship (Defended February 2017)
12. Salmon Landi - Science Phd Program – CAPES Fellowship
13. Serguey Roberto Cusato Junior - OCV Phd Program
14. Silvia Reis - Engeneering Phd Program – FCT Fellowship (Defended 2017)
15. Simone Rodrigues - Engeneering Phd Program – FCT Fellowship
16. Sofia Ferreira - Engeneering Phd Program
17. Vania Pinto - Engeneering Phd Program – FCT Fellowship (Defended 2017)

7.2 Research Line Key Words

7.2.1 Assessment and enhancing visual performance

Binocular vision	Color science	Ocular accommodation
Color science	Computational models	Ocular disease
Epidemiology	Contact lenses	Ocular surface
Visual assessement	Dry eye	Ophthalmic instrumentation
Ocular accommodation	Electrophysiology	Optical modelization
Ocular growth	Epidemiology	Optics
Ocular surface	Glare	Perception
Optics	Hyperspectral imaging	Presbyopia
Perception	Image quality metrics	Refractive surgery
Visual electrophysiology Visual enhancement	Intraocular lenses	Rehabilitation
Visual optics	Irregular cornea	Retina
Visual rehabilitation	Keratoconus	Stereoscopic vision
Aberrometry	Low vision	Tear film
Accommodative disorders	Microbial contamination	Vision performance
Adaptive optics	Myopia	Visual ergonomics
Augmented reality	Myopia control	Visual optics
Binocular vision	Myopia progression	Visual optimization
		Visual therapy

7.2.2 Plasmonic, luminescent, magnetic and hybrid nanostructures for optoelectronic, biomedical and environmental applications

Electronic structure,	FRET (Forster Resonance Energy Transfer)	Photocatalysis
(Bio)Sensors	Graphene	Plasmonic nanostructures
2D materials	Lipid (bi)layer	Quantum dot
Anti-tumour drugs	Luminescence	Quantum materials
Biomolecules	Magnetic nanoparticles	Quantum nanostructures
Bionanoconjugates	Mathematical Physics	Raman and Infrared Spectroscopy
charge carrier dynamics,	Nanocarriers	Solar Cells
Density Functional Theory (DFT)	Nanomedicine	Sol-gel
Drug delivery	Nonlinear optical materials	Surface Enhanced Raman Spectroscopy
Energy transfer / FRET	Optimal Control Theory	Surface plasmon resonance
Exciton	Partial differential equations	Thin films
Finite elements	Phase transitions	Transport properties,
Fluorescent probes	Phonon	Ultrafast Spectroscopy

7.2.3 Functional and smart materials and surfaces for advanced applications

Actuator	HWCVD - Hot wire chemical vapour deposition	Photoluminescense, fluorescence
Biomaterials	Hybrid material	Piezoelectric
Biosensor	Laser ablation	PLD - Pulsed laser deposition
Coating	Magnetoelectrics and magnetic properties	Printed, printing
Coating - antibacterial	Membrane	PVD - physical vapour deposition
Coating - medical device	Microporous	Sensor
Crystal growth	Modelling, materials modelling	Smart material
Crystallography	Nanomaterial, nanocluster, nanoparticle	Smart polymer
Decorative coating	Nanoporous	Solar cell
Density functional theory	Nitride	Sputtering
Detector	Non-linear optics	Surface topography, tribolofy, wettability
Electrical, thermal, mechanical properties	Optical properties	Synthesis
Energy harvesting	Oxide	Thin film, thin layer
Ferroelectric	Photocatalysis, catalysis	