Universidade do Minho
Escola de Ciências

Physics Centre of Minho and Porto Universities
Minho pole

Gualtar, Braga

Azurém, Guimarães

CF-UM-UP

Annual Report 2022

FCT
Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR

Cofinanciado por:
COMPETE 2020
PORTUGAL 2020
UNIÃO EUROPEIA
Fundo Europeu de Desenvolvimento Regional

Contents

Executive Summary

After 2 years with some difficulties due to the pandemic, this was another year with some barriers in executing the funds.The execution of funds for most projects was done with long delays, both in the acquisition of goods and services and in the hiring of human resources, which in some way limits the scientific performance of some projects. The hiring processes continue to be very lengthy and subject to a slow administrative process. This means that the resilience, determination and adaptability of researchers is becoming increasingly important.

In terms of research carried out at the Physics Center of Minho and Porto Universities (CF-UM-UP), and following the Materials Roadmap 2030, most researchers have focused on the development of new Materials and their applications. Of the 59 projects that were active in 2022, 32 projects had Engineering Sciences and Technologies as their main scientific area, while 23 projects had Exact Sciences - Physics as their main scientific area. Likewise, of the 77 doctoral students on December 31, 2022, 33 of them were enrolled in a doctoral program in Materials Engineering, while 20 of them were enrolled in the doctoral program in Physics (MAP-Fis) and 17 in the doctoral program in Optometry and Vision Sciences. This commitment will have to do with funding opportunities, as funding entities have focused on funding applications-oriented projects to the detriment of fundamental research.

As happened in last years, the number of regular journal articles continued to grow (204 in 2022 vs 194 in 2021 and 190 in 2020 for Clarivate WoS/Scopus papers), although the conference journal articles continue with a tendency to decrease (8/5/17/23 in last four years). The average impact factor of the regular journal articles continue to increase (5.32 in 2022 vs 5.25 in 2021 and 4.02 in 2020), which shows an increase in the visibility of the Centre. In published articles, it is worth mentioning the papers in Advanced Functional Materials (IF=19,924), Nano Energy (IF=19,069), Chemical Engineering (IF=16,744), 3 papers, and Journal of Hazardous Materials (IF=14,8).

The number of integrated members of the Centre decreased from 66 to 62, due essentially to the end of the 2018 FCT Call projects and, consequently, the associated researcher contracts.

Noteworthy is the participation of 12 members of the Centre in journal editorial boards, being part of them editors of some journals or guest editors of special issues.

The numbers of PhD students, affiliated to the Minho pole of CF-UM-UP, supervised or co-supervised of Centre members continue at same level with 77 PhD theses ongoing at December 31, 2022 (83 in 2021 and 76 in 2020), which justifies the dynamism of the Centre and the publication rate increase. Consequently, the number of theses completed in 2022 (12) is at the level of recent years.

The number of ongoing funded projects at CF-UM-UP - Minho during 2022 remained stable (59), with a contracted funding of 2.1 M€ (2.7 M€ in 2021). The received funds during 2022 reached 1.4 M€ (1.7 M€ in 2021), with a budgetary execution of 1.2 M€ (1.4 M€ in 2021), which shows a tendency of a decrese of contracted funds, which is related to the end of the projects of the Exceptional 2018 FCT Call. That year, 28 research projects were started, a value well above the number of projects started in the following 4 years, in which an average of 10.3 research projects were started. In addition, we secured from FCT a funding of 1.0 M€ through contracts of researchers with PhD (FCT researcher) and 0.9 M€ through PhD grants in 2022.

The Portuguese agencies, the Foundation for Science and Technology (FCT) and the National Innovation Agency (ANI), remain our principal sources of funding. Funds contracted with European Commission in 2022 are slightly above the average value of the last 5 years, and are still below what can be considered a good performance. Of the 59 projects that worked in 2020, 37 were funded by FCT (including 3 strategic projects of the Centre and 4 bilateral programs), 13 by ANI, 7 by the European Commission and 2 by companies.

The global results show a growth in scientific production, which, reveals a high degree of resilience, associated with a high determination, dedication and effort of the Centre's researchers. Finally, I would like to thank the executive team Mikhail Vasilevsky, Madalena Lira, Paulo Coutinho and Carlos Tavares for their support and collaboration, the administrative support Vitor Pacheco and Fernanda Costa, and the help of the technical staff who collaborated in various ways in the operation of the Centre.

Luís Rebouta
Director, CF-UM-UP

Mission and Objectives

Our Mission

The main goal of the CF-UM-UP as a whole is to perform internationally competitive research in several areas of Physics, fundamental and applied, linked to other disciplines of natural sciences and engineering, with strong international links and relevant, as far as possible, at the local level. CF-UM-UP has a critical mass of highly qualified researchers and aims at keeping equilibrium between applied and fundamental research and being the base for advanced training in Physics and adjacent areas, in the North of Portugal.

Organization structure

Management Entities

Director:
Luís Manuel Fernandes Rebouta

Deputy Director:
Mikhail Igorevich Vasilevskiy

Executive Committee Members:
1. **Maria Madalena Cunha Faria Lira**
2. **Paulo José Gomes Coutinho**
3. **Carlos José de Macedo Tavares**

Strategic Research Lines

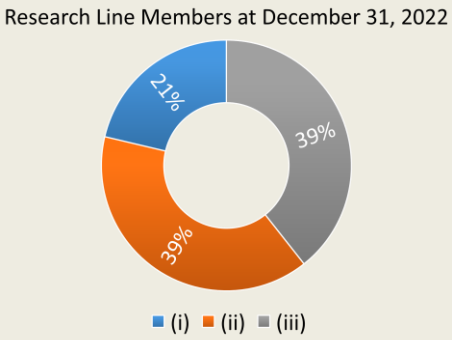
The research at the CF-UM-UP is conducted along the following Strategic Reaseach Lines:

(i) Assessment and Enhancing Visual Performance
Coordinator: Madalena Lira

(ii) Physics of Quantum Materials and Bionanostructures
Coordinator: Paulo Coutinho

(iii) Functional and Smart Materials and Surfaces for Advanced Applications
Coordinator: Carlos Tavares

(iv) Quantum Physics and Fields in High Energy and Condensed Matter Theory
Coordinator: Eduardo Castro



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.

Scientific Activity

Description of the Main Activities by Research Line

Assessment and enhancing visual performance

Research Line Coordinator
Madalena Lira

In the Research Line **Assessment and Enhancement of Visual Performance**, current areas of expertise cover research in fundamental and applied topics focused on:

- Study of refractive errors and optical solutions for the control of myopia progression.
- Presbyopia, corneal disease and visual performance.
- Contact lens and ocular surface.
- Electrophysiological recording of the retinal activity.
- Visual and ophthalmic optics, design and metrology of new intraocular lenses for presbyopia correction.
- Understanding how normal and abnormal colour vision work, in particular how the perception of colours can be measured, modified and improved.
- Research in epidemiology, low vision and visual rehabilitation.
- Development and optimization of instruments for imaging the anterior segment of the eye.

The group has been the base of several clinical trials and validation tests in the context of partnerships with industry and hospitals and have several collaborations with other Portuguese and International companies and universities. The ranking published in the Journal of Clinical and Experimental Optometry (evaluated 245 universities and 46 countries) recognizes the UMinho in the international vanguard of teaching and research of Optometry and Vision Sciences being among the top 20 best institutions worldwide and the only in Europe.

The demographic changes will impose a new reality and challenges in the area of visual health are under active development.

Research Highlight

Ocular optical and biometric changes induced by accommodation

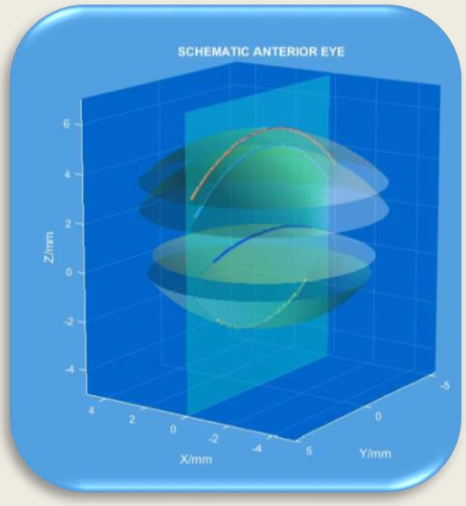
The project developed in the Visual Optics and Ophthalmic Instrumentation Research Lab had as main objective the study of biometric and optical changes of the crystalline lens with accommodation and its impact in subjective retina image quality.

It was developed instruments to image the anterior segment of the eye and evaluated the changes in ocular optical quality with accommodation in both central and peripheral retina. It allowed us to study of accommodative disorders.

The main results of the projects were:

1. Develop of an individual eye model.
2. The applications of dynamical and real-time aberrometry were explored to detect anomalies in the accommodative response.

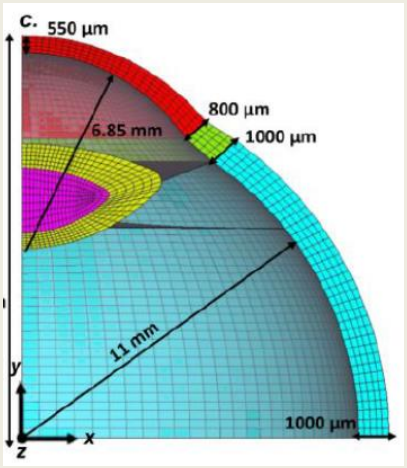
Real-time aberrometry applied to the diagnosis of accommodative dysfunctions, showed to be an efficient objective method to detect these dysfunctions. Even subjects with symptoms during near vision tasks but with normal clinical exams present alterations compared to a control group. Therefore, this technique may help to understand the origin of symptoms and detect anomalies in accommodation.



Research Highlight

Opto-biomechanical Eye Research Network OBERON Marie Skłodowska-Curie grant

OBERON aims to create a unique, biologically and physiologically relevant modelling platform describing the interactions between ocular mechanical properties, optics and geometry adaptable to a wide range of ocular conditions.



Specifically, we intend to:

- Create a research network where a group of talented ESRs can train, work together and exchange ideas with European experts on topics related to visual optics and biomechanics.
- Improve fundamental knowledge on unsolved aforementioned topics.
- Create the opto-biomechanical model as a platform for future analyses.
- Expand this platform to incorporate the influences of ageing, accommodation, select pathologies, and responses to therapies (e.g. cross-linking, refractive surgery, intraocular lens implantation).
- Develop innovative applications in corneal and cataract surgery, highlighting the platform's strength.
- Ensure that Europe cements its place as a world leader in the field of visual optics and eye modelling.

Participants: 8 universities (Coordinator CFUM); 5 non-academic partners; 5 countries; 15 Early Stage Researchers.

Research Highlight

Eye-LRCN: A Long-Term Recurrent Convolutional Network for Eye Blink Completeness Detection

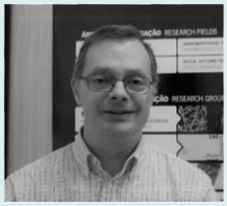
Computer vision syndrome causes vision problems and discomfort mainly due to dry eye. Several studies show that dry eye in computer users is caused by a reduction in the blink rate and an increase in the prevalence of incomplete blinks. In this context, this study introduces Eye-LRCN, a new eye blink detection method that also evaluates the completeness of the blink. The method is based on a long-term recurrent convolutional network (LRCN), which combines a convolutional neural network (CNN) for feature extraction with a bidirectional recurrent neural network that performs sequence learning and classifies the blinks. A Siamese architecture is used during CNN training to overcome the high-class imbalance present in blink detection and the limited amount of data available to train blink detection models. The method was evaluated on three different tasks: blink detection, blink completeness detection, and eye state detection. We report superior performance to the state-of-the-art methods in blink detection and blink completeness detection, and remarkable results in eye state detection.

Research Highlight

Cost-effectiveness of basic vision rehabilitation in Portugal

Researchers from our centre and from three other institutions concluded in 2022 a study on cost-effectiveness of basic vision rehabilitation. The group investigated the clinical impact of vision loss and vision rehabilitation and the cost-effectiveness of a basic vision rehabilitation service in Portugal. The results showed links between perceived social support, anxiety and health-related quality of life amongst people at need of vision rehabilitation. The authors recommend analysing these aspects of the patients that are beyond clinical measures. It is important to understand the impact of mental health conditions on individuals with vision loss in order to develop better treatments and interventions that can potentially improve their quality of life. The project gave solid evidence of positive clinical impact of a basic vision rehabilitation intervention and showed that a basic vision rehabilitation services are cost-effective. These findings are important to clinical and rehabilitation practices and for planning eye care.

Physics of quantum materials and bionanostructures



Research Line Coordinator
Paulo J. G. Coutinho

The focus of the overall research performed in the strategic line **Physics of Quantum Materials and Bionanostructures** is the development, both at theoretical and fabrication levels, of quantum materials and (bio)nanosystems and their applications in nowadays society. Applications range from biomedical (biosensing, therapeutics, bioimaging) to environmental (photocatalytic remediation and hydrogen photoproduction). In general, theoretical and experimental aspects related to the electronic and optical properties of materials in which quantum effects play an important role are addressed. Particular emphasis is devoted to theoretical research in graphene, 2D materials and other quantum materials with potential applications in Quantum Information.

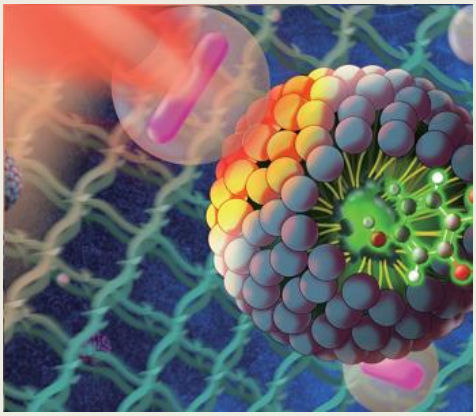
The research involves the characterization of the structural, dielectric, magnetic and optical properties of materials such as mixed ferrite magnetic nanoparticles, multiferroic thin films, plasmonic nanoparticles and electrospun fibers. Hybrid materials, such as magnetoliposomes and magnetolipogels, are investigated for controlled drug delivery and hyperthermia applications. *Ab initio* quantum-mechanical calculations for the modelling of molecular photophysical properties and of 2D-materials band structure are also performed. Machine learning algorithms were developed for remote sensing and materials characterization. Non-linear optical properties of graphene were experimentally measured and a novel second harmonic generation microscope was developed.

Sensors development is also an area of research with great impact, in which thin films of noble metal nanoparticles (Au, Ag) embedded in a metal oxide matrix are being optimized for gas sensing or biosensing. Important achievements are a patented graphene sensor for detection of hepatitis C virus, the discrimination between grape varieties in vines and Douro wines, and detection of dopamine with unprecedented sensitivity.

Research Highlight

Multifunctional bionanosystems for controlled release of drugs and insecticide compounds

New magnetic and/or plasmonic lipogels (combination of liposomes with hydrogels containing gold nanorods and/or magnetic nanoparticles) that allow the sustained release of drugs and the control of the release rate (via NIR laser irradiation or application of an alternating magnetic field) were developed. The advances are important to overcome several limitations in the therapeutic administration of anticancer drugs, such as low water solubility, low bioavailability and adverse side effects. The work was highlighted in the cover of the RSC journal *Soft Matter.*

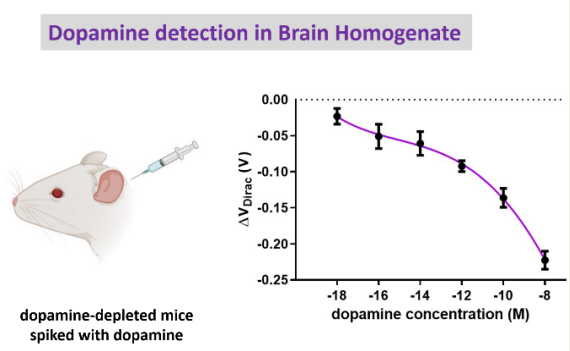


Liposomal formulations were loaded with novel eugenol derivatives with insecticidal activity. Compound-loaded nanoliposomes made of natural constituents have shown a strong activity against insect cells and a reduced toxicity in human keratinocytes. Considering the usual routes of pesticide poisoning, specifically skin, these results are very promising for future application in crops, allowing a sustained release (2022 Best Cover Award of Nanomaterials).

Research Highlight

A new platform for ultrasensitive dopamine detection

Dopamine is an essential neurotransmitter underlying several brain disorders, such as Parkinson's. A new platform was developed for ultrasensitive dopamine detection, in a collaboration of INL, CF-UM-UP and ICVS. The sensor chip, with an area of 4.5 × 4.5 mm², is based on graphene transistor arrays functionalized with a selective DNA aptamer for dopamine biorecognition. The array configuration permits independent and replicated measurements producing robust average data and reducing random measurement variability. When tested with 10 μL artificial cerebral spinal fluid samples, the sensor showed a dopamine limit-of-detection of 1 aM with 10 orders dynamic detection range and a 22 mV/decade peak sensitivity. Detection in dopamine-depleted brain homogenates from a mouse model of Parkinson's disease spiked with dopamine was also possible, overcoming sensitivity losses typically observed in ion-sensitive sensors in complex biological samples and paving the way for the sensor's use in academic and pre-clinical pharmaceutical research and clinical diagnosis.



Research Highlight

Second harmonic microscopy

Second harmonic microscopy is a valuable tool for researchers in a variety of fields, as it provides high-resolution images of complex structures that are difficult to visualize using other techniques. Second harmonic microscopy can characterize structures of non-centrosymmetric materials at the micro- and nanoscale, including polymers, ceramics, and dielectrics. On the biological side, it allows one to study the organization of cells and to visualize their internal structures, including the cytoskeleton, nucleus, and other organelles. Furthermore, it is a sensitive measure of the distribution and orientation of collagen in tissues. We have developed a sensitive system excited by a pre-compressed femtosecond fundamental beam at approximately 800 nm with a spatial resolution of roughly 2 microns in the focal plane and polarization discrimination for both the excitation and detection arms.

Research Highlight

Novel nanofibers and thin film piezo, pyro and magnetic composite systems for energy harvesting and spintronics

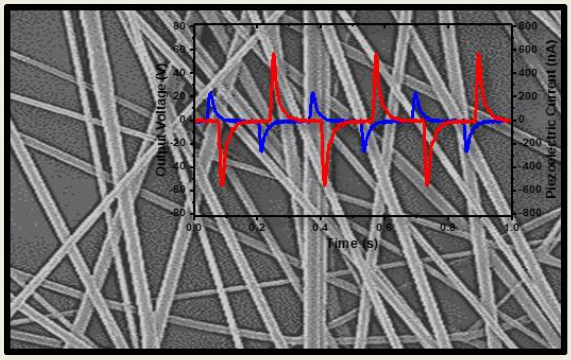
Novel chiral and cyclic dipeptides were synthesized. Their quantum confinement and blue luminescent properties were investigated. Large-scale hybrid electrospun arrays containing the dipeptides embedded in biocompatible polymers were shown to exhibit strong piezoelectric properties under a periodic mechanical force, functioning as bioenergy harvesting sources. Novel lead-free organic ferroelectric perovskite crystals were also synthesized. The pyroelectric and piezoelectric properties

Research Highlight

Development of machine learning techniques for polarimetry-based remote sensing and characterisation of materials

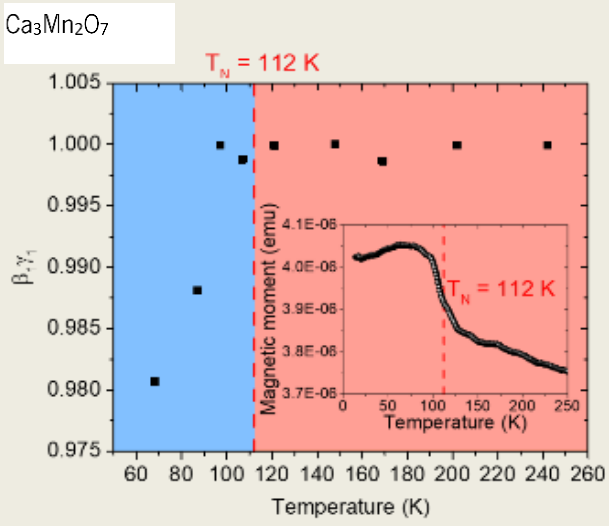
Polarimetry is concerned with measurements of polarization states of light. Polarimetry techniques enable studies of a variety of materials' properties and remote sensing by analysing backscattered light. The polarised response of a material to incoherent light is entirely described by its Mueller matrix (MM) consisting of 4×4 real elements, which can be measured. In principle, MM can be derived from the electrodynamics and known properties of the material and its surface; however, this

of electrospun hybrid nanofiber arrays containing an organic ammonium triiodide perovskite revealing strong piezoelectric voltage and pyroelectric coefficients.

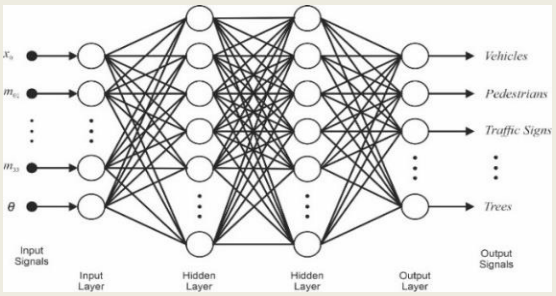


New nanostructured multiferroic nanostructures consisting of $Ca_3Mn_2O_7$ naturally layered perovskite thin films and $BaTiO_3$-$CoFe_2O_4$ ferroelectric-ferromagnetic bilayer composites were synthesized, and their structural, microstructural, dielectric and magnetic properties were studied.

Prussian blue magnetic thin films were prepared and the influence of different preparation methods on their electrochemical properties was characterized.



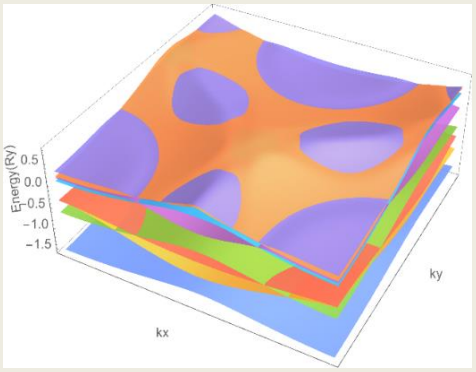
is not possible for most real-world materials. Machine learning algorithms, Artificial Neural Network (ANN) and Decision Tree, were applied to establish phenomeno-logical relations between the measured MM elements and material's type or property (e.g. surface anisotropy). In this work, performed in collaboration with Bosch Portugal, the best results were obtained with an ANN trained with a database of measured materials' MMs. To validate the performance of the ANN, it was tested by classifying a new set of samples, obtaining an accuracy of 95.7% in classification of urban objects.



Research Highlight

Calculating nonlinear properties using unsupervised machine learning

Nonlinear properties of materials are inherently difficult to calculate using first principles calculations. We developed the berry software, which extracts the wavefunctions from a first principles density functional theory calculation, and classifies the states using graph theory and unsupervised machine learning in such a way as to make them differentiable in reciprocal space. That allowed us to calculate Berry geometries of two-dimensional materials, like Berry connections and curvatures, and from them we were able to calculate second harmonic generation optical conductivity of single layer boron nitride and indium selenide.



Functional and smart materials and surfaces for advanced applications

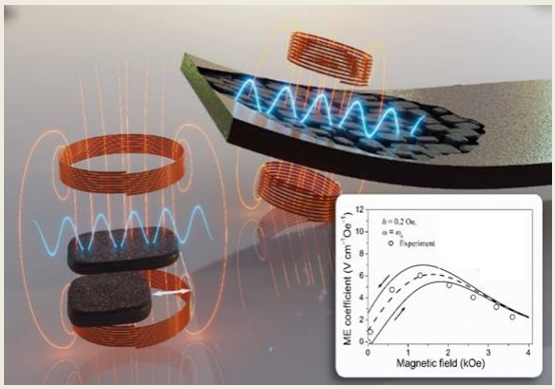
Research Line Coordinator
Carlos Tavares

The focus of the overall research done in the strategic line **Functional and smart materials and surfaces for advanced applications** resides in the development of novel materials based on polymer composites, nano structures, alloy oxides and nitride films. The inherent studies involves the understanding of the electrical, magnetic, optical and other physical-chemical properties of these materials, having in mind applications in several types of devices, such as sensors, actuators, battery elements including novel separation membranes, transparent thermoelectric films, solar absorbers, information and energy storage, amongst other functional and smart materials. Energy considerations are essential in nowadays society and increasingly dependent on mobility and interconnectivity with the need to reduce the environmental impacts related to fossil fuels. The Centre of Physics of the University of Minho is undergoing competitive research in advanced materials for energy. The principal techniques for material development in the form of thin film deposition are magnetron sputtering and laser ablation. A low cost technique by direct inkjet printing of material is also recurred, as other nano and micro structuring techniques functionalize materials.

Research Highlight

Novel Polymer-based composites with giant magnetoelectric coupling

A new type of giant magnetoelectric (ME) coupling emerging from magnetoelastic structural transformations of martensitic Ni-Mn-Ga alloy has been discovered, accompanied by noticeable volume changes in a Ni-Mn-Ga/P(VDF-TrFE) composite. In the thin film composite, with just 10% in weight of Ni-Mn-Ga particles distributed in the P(VDF-TrFE) piezopolymer, an unparalleled resonance amplification of the ME effect was registered, being measured a 6.05 $V \cdot cm^{-1} \cdot Oe^{-1}$ under AC magnetic drive field of 0.2 Oe and DC bias field of 1300 Oe. The physical process related with such amplification has been detailed and explained by a theoretical formalism that includes the volume magnetostriction of the magnetostrictive



Ni-Mn-Ga particles and the resonant elastic oscillation of the piezoelectric P(VDF-TrFE) matrix. These findings provide predictive instruments for the engineered amplification of the ME coupling, but also have a broad technological impact in applications for such as energy harvesting, sensing and actuators.

Research Highlight

Thin films for multi-sensing response

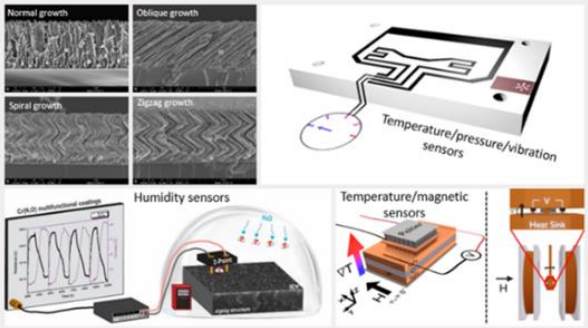
New sensors and electrodes, based on nano-designed thin film structures, are developed for providing transduction of physical properties into electronic signals. To reach this target, nanostructured thin film systems are deposited by magnetron sputtering, in oblique and glancing angle deposition geometries. The main idea is to obtain punctual or matrix-like tactile sensing through the targeted applications. The optimized thin film systems can scan shape, texture, friction, force, pain, temperature, and several other physical quantities. To provide some next-generation solutions to control production variables

Research Highlight

Novel battery separator membrane

A collaboration between researchers from the University of Minho (Braga, Portugal) and the Basque Center on Materials, Applications and Nanostructures (Leioa, Spain) have developed a novel battery separator membrane allowing to improve battery stability over cycling. The growth of world's energy demand and the increasing use of electronic devices leads to the need of developing more efficient energy storage systems. Lithium ion batteries represent the most suitable devices for this purpose, but new materials and concepts are still needed to further improve performance. In this work, the

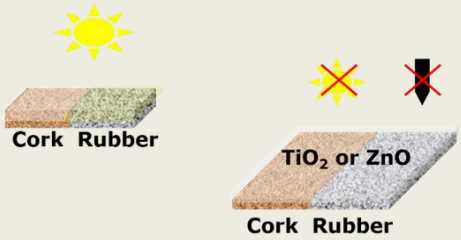
such as temperature, pressure, humidity, or vibration, to improve on-site and real-time products quality, constant monitoring of materials behavior, processes development, and devices/materials sustainability are analyzed. Working in a close loop with industrial partners, the group acts also in the development of key hardware and software features that are important in the design of sensors and sensor systems for different environments.



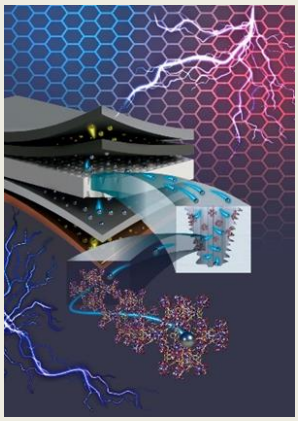
Research Highlight

UV-protective wear resistant films on complex substrates: cork and rubber

Cork and rubber have a wide range of applications going from wine stoppers and gym flooring to footwear industry and aerospace industry, combining a variety of particular properties, but when exposed to sunlight, their surface shows ageing due to the incidence of UV radiation, and when they are employed to friction, they suffer severe mechanical wear. Portuguese cork and rubber companies were interested in solving this ageing and wear problems of these materials, maintaining their original characteristics.



The deposition of metallic oxide thin films, with high transmission in visible region, and high absorption in the UV region, but also resistant to mechanical wear, can be a solution to solve the problems in some of their applications. Coating cork and rubber with wear resistant thin films, transparent to visible but blocking UV radiation can be a good solution. Coating both materials is not easy because they are granulated, exhibit high deformation and roughness and are sensible to the temperature. Despite this challenge, we successfully deposited metal oxides by ALD and magnetron sputtering on both materials that block UV radiation.

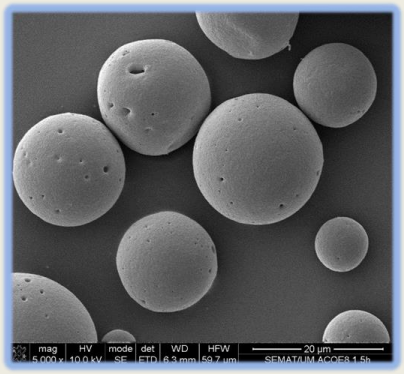


researchers reported on novel Li-ion separators, relying on hybrid membranes based on Metal-Organic Frameworks (MOFs) and poly(vinylidene fluoride-co-hexafluoropropylene) (PVDF-HFP) allowing to improve battery stability by tailoring the hierarchical porous structure of the membrane. Three different MOFs have been used to tailor the porous structure and ionic conductivity of the separators, leading to batteries with improved performance by minimizing capacity fading at high charge/discharge rates.

Research Highlight

Biodegradable microcapsule systems for controlled release

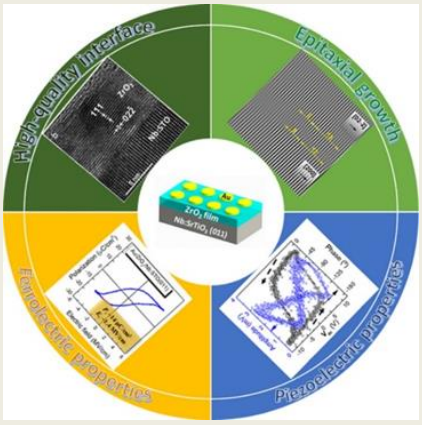
Development and production of biodegradable microcapsule systems for the controlled release of specific compounds. This patented technology consists in photocatalytic microcapsules in a powder form that when illuminated by solar or artificial light triggers the controlled release of an encapsulated compound from within, such as in insect repellent, fragrance, agrochemical, paint additive, amongst other active agents formulas. The biggest advantage is that the microcapsules do not need to be porous or fragile in order to promote the diffusion of its content, since this diffusion is governed by light activation. Ongoing applications in the industry include home textiles, tents, automobile seats, mosquito repellents, anti-bacterial textiles, hygiene and cosmetics.



Research Highlight

Ferroelectric oxide thin films for information and energy storage

The discovery of ferroelectricity in binary oxide thin films represents a significant breakthrough in the field of ferroelectrics. Researchers at CF-UM-UP revealed novel polar rhombohedral and orthorhombic phases in epitaxially strained ZrO2 thin films, using advanced physical vapor deposition techniques available at CF-UM-UP, such as ion-beam sputtering technique. Unlike polycrystalline films, epitaxial

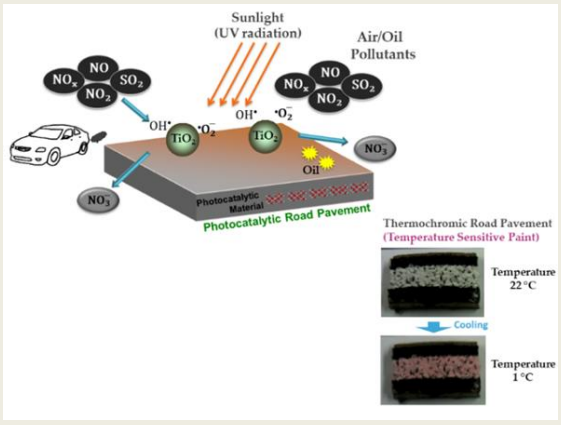


films exhibit wake-up free ferroelectric properties that can impact on novel technologies for non-volatile memories, neuromorphic devices and supercapacitors. Importantly, the research led by CF-UM-UP, used advanced experimental and simulation techniques to demonstrate for the first time that defect engineering, namely through oxygen vacancies, plays a crucial role in achieving rhombohedral ZrO_2 films with enhanced ferroelectric properties. Our findings reveal the importance of both strain and defect engineering to stabilize rhombohedral ZrO_2 films with superior ferroelectric properties.

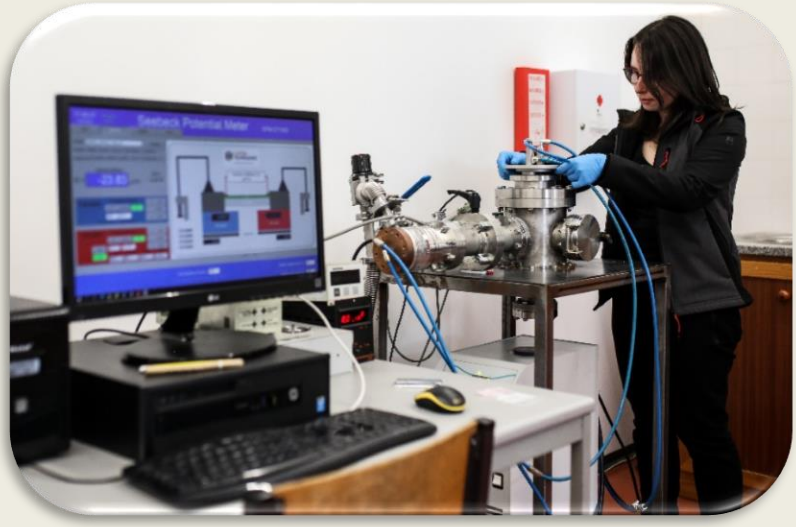
Research Highlight

Smart asphalt pavements

Nanomaterials Applied on Innovative Road Pavements for Air Cleaning (NanoAir) have been an important strategy in order to mitigate environmental and social problems related to air pollution due to road traffic and also to promote road safety. The main goal of NanoAir comprises the development of innovative multifunctional road pavements that have the ability to clean up the surrounding air (NO_x and/or SO_2 pollutant gases from vehicle exhaust emissions). In particular, in areas with high density of urban mesh and also having the ability to promote the photodegradation of organic compounds (oils and greases) adsorbed to road surface, cleaning it and therefore preventing the reduction of friction caused by organic compounds (leading to serious road accidents). The



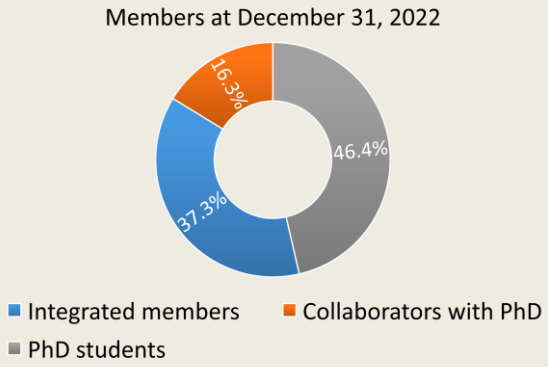
inclusion of specific nano/micromaterials allows road pavements to acquire important new functions and applications such as: to improve reflectivity and visual definition of road edges or to provide anti-icing coatings applied to pavement surfaces to improve road safety in cold regions.

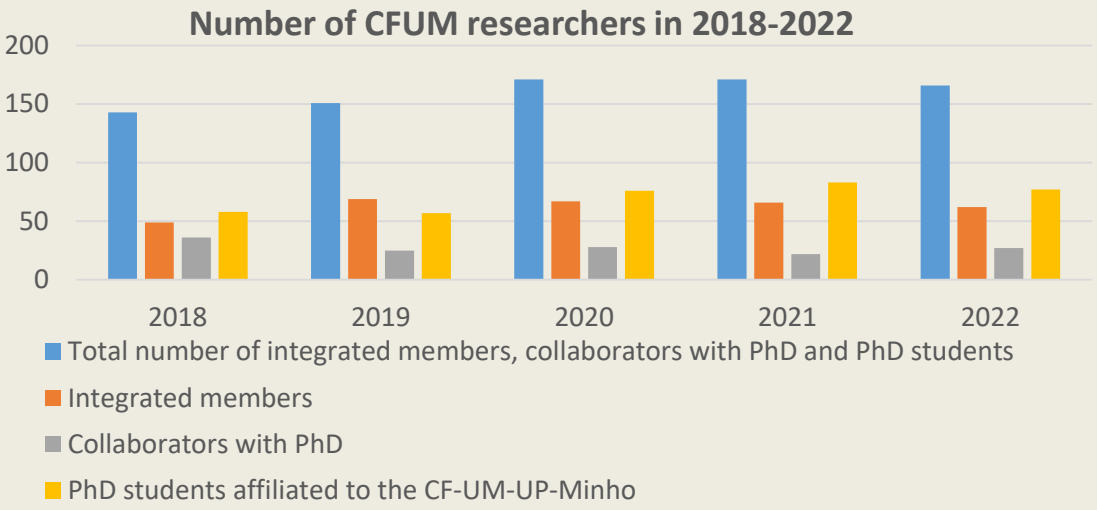


CFUM in numbers

Members (as of December 31, 2022)

Integrated Members with PhD	62
Post-Docs and Collaborators with PhD	27
PhD Students with CFUM affiliation	77



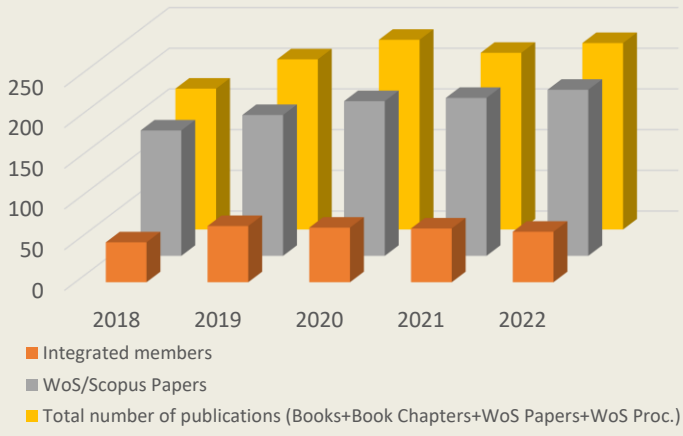


Number and type of Publications

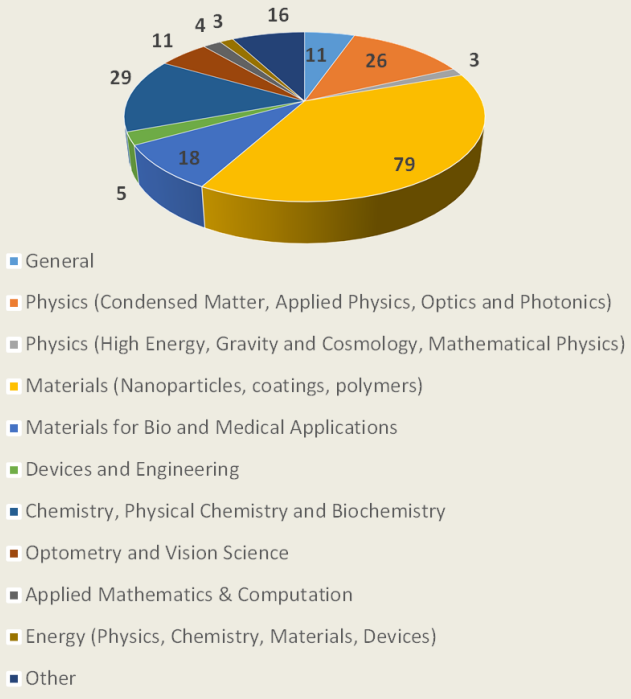
Publications in 2022

WoS/Scopus papers (regular journal articles/ conference journal articles)	204/8
Books (written/edited)	1/7
Book chapters	16
Patents (national /international)	0/1
Oral Presentations in International Conferences (total/by invitation)	152/37

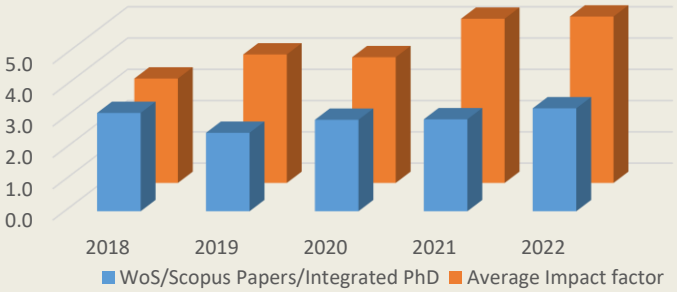
Publications in the period 2018-2022



Published papers per journal area of research in 2022



Number of ISI publications per integrated member and average impact factor of journals where the papers were published



Scientific Supervision Numbers

			total
Master Theses	COMPLETED	-	61
PhD Theses affiliated to CFUM	ONGOING	61/16	77
(supervised /co-supervised by a centre member)	COMPLETED	11/3	14

Funding Summary

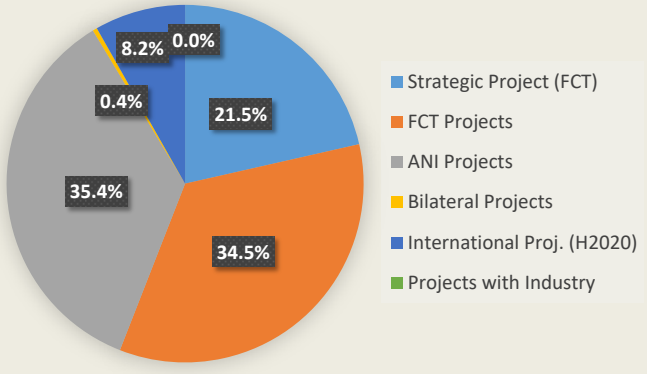
Funding in 2022

	Contracted in 2022	%	Received in 2022	%	Executed in 2022	%	Number of projects in 2022
Strategic Project (FCT)	387,308.31 €	18.3%	230,428.50 €	16.6%	266,808.64 €	20.6%	3
FCT Projects	549,579.72 €	26.0%	667,632.96 €	48.2%	428,941.12 €	33.2%	30
ANI Projects	910,059.51 €	43.0%	449,883.18 €	32.5%	490,336.72 €	37.9%	13
Bilateral Projects	6,000.00 €	0.3%	0.00 €	0.0%	5,042.36 €	0.4%	4
International Proj. (H2020)	251,420.96 €	11.9%	26,348.00 €	1.9%	102,372.44 €	7.9%	7
Projects with Industry	11,228.25 €	0.5%	11,228.25 €	0.8%	0.00 €	0.0%	2
Total	**2,115,596.75 €**	**100%**	**1,385,520.89 €**	**100%**	**1,293,501.28 €**	**100%**	**59**

The contracted value includes overheads and the university's contribution to ANI's and European projects with allocation of teacher´s salaries. The amount received and the amount executed do not include overheads or the university's contribution to ANI's projects. Thus, both the amount received and executed must be significantly smaller than the amount contracted.

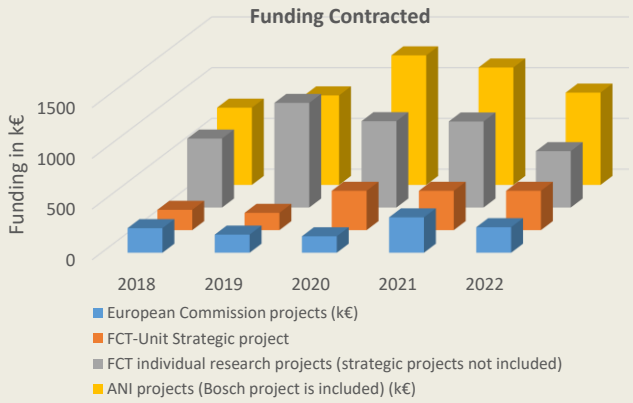
The values of the contracted projects were obtained by dividing, in each project, its global financing equally throughout its duration.

Funding executed in 2022

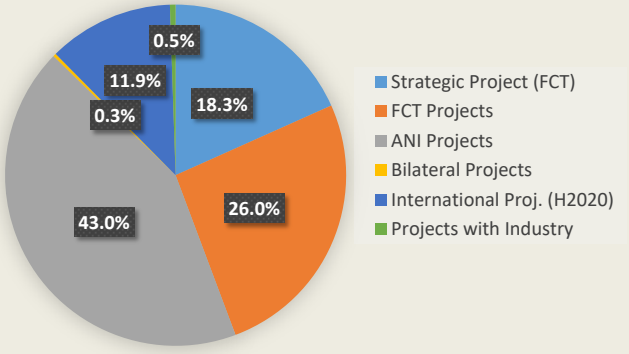


Funding from FCT is divided into four different items. The first two correspond to unit strategic project funding and individual research projects funded by FCT. The third item includes researchers with a contract paid by the FCT (FCT researchers, both from individual and institutional programs) in which their host research unit is the UMinho pole of the CF-UM-UP. The fourth item in the figure corresponds to the funding of PhD schorlarships and PostDocs directly paid by FCT to grant holders, whose host unit is the UMinho pole of the CF-UM-UP. The funding of research grants and contracts associated with individual projects and with the strategic project are already included in the funding of the respective projects, so they were not taken into account.

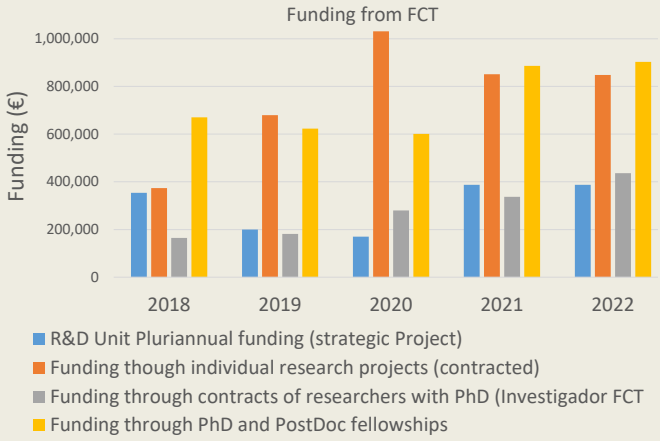
Funding history 2018-2022 (Contracted values by funding agency). Values in k€.



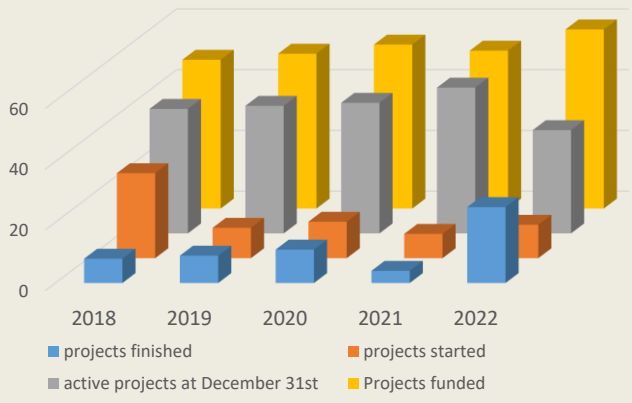
Funding contracted in 2022 according to projects' contracts



Funding from FCT in the period 2018-2022



Active Projects (started and finished) in the period 2018-2022



Members (as of December 31, 2022)

Integrated members

António Filipe Teixeira Macedo
António J. Onofre Gonçalves
António Manuel Gonçalves Baptista
António Manuel Queirós Pereira
António Mário Fonseca Almeida
Armando José Barros Ferreira
Bernardo Gonçalves Almeida
Bruno António Campos Amorim
Cacilda Maria Lima de Moura
Carlos José de Macedo Tavares
Carlos Miguel da Silva Costa
Clarisse Marta Oliveira Ribeiro
Claudia Jesus Ribeiro Lopes
Daniela Patricia Lopes Ferreira
Elisabete Maria Castanheira Coutinho
Etelvina de Matos Gomes
Francisco José Machado de Macedo
Gaspar José Azevedo Machado
Gueorgui Vitalievitch Smirnov
João Manuel Maciel Linhares
João Pedro Hall Agorreta Alpuim
Joaquim Alexandre Carneiro
Joel Nuno Pinto Borges
Jorge Manuel da Silva Figueiredo
Jorge Manuel Martins Jorge
José Carlos Viana Gomes
José Filipe Vilela Vaz
José Manuel González Méijome
José Pedro Basto da Silva
Luís António Gachineiro da Cunha
Luís Manuel Fernandes Rebouta
Luís Manuel Gomes Vieira
Luís Silvino Alves Marques
Manuel Filipe Martins Costa
Maria de Fátima Guimarães Cerqueira
Maria de Jesus Matos Gomes
Maria José Bastos Pires Lima
Madalena da Cunha Faria de Lira
Mário António de Castro Pereira
Mário Rui da Cunha Pereira
Marlene Susana Dionísio Lúcio
Marta Maria Duarte Ramos
Michael Scott Belsley
Miguel Faria Ribeiro
Mikhail Igorevich Vasilevskiy
Nuno Miguel Machado Reis Peres
Paulo José Gomes Coutinho
Paulo Rodrigues Botelho Fernandes
Pedro Libânio Abreu Martins
Ricardo Pedro Mendes Ribeiro
Rosa Maria Ferreira Batista
Rui Miguel Soares Pereira
Rute Juliana Macedo de Araujo
Sandra Maria de Braga Franco
Senen Lanceros-Mendez
Sérgio M. Cardoso Nascimento
Sofia Oliveira Lopes
Stanislav Lazarov Ferdov
Teresa Maria Santos Ribeiro Viseu
Vasco Manuel Pinto Teixeira
Veniero Lenzi
Yuliy Bludov

Other affiliated members with PhD

Anna Paula Safenraider Crema
Anabela Gomes Rolo
Ana Rita Oliveira Rodrigues
Cristiana Filipa Almeida Alves
Diego Martinez Martinez
Eya Hergli
Flávia Vieira Barbosa
Filipe André Peixoto Oliveira
João Pedro Nunes Pereira
Jaime Eduardo Moutinho Santos
Jorge António Silva Mendes
Júlia Maria Ayres de Campos
Manuel Rodrigues
Marcio Correa
Maria Teresa Pitta de Lacerda-Arôso
Margarida Maria Francesko Fernandes
Maria Elisabete Oliveira
Mário Jorge Dias Zamith Silva
Martin Andritschky
Nadia Arrousse
Nelson Miguel Macedo Silva Pereira
Pedro Filipe Ribeiro Costa
Peter Michael Schellenberg
Sandra Maria Fernandes Carvalho
Sandra Mariana Silva Marques
Kishor Sapkota
Vasco Miguel Nina de Almeida

Member Engagements and Achievements

Conferences, Workshops and seminars organization

CIOCV22 - 19th International Congress of Optometry and Vision Sciences 2022- Universidade do Minho; Altice Fórum Braga, 21st to the 22nd of May 2022

International Conference: Social Inclusion of the Visually Impaired Students Through STEM Projects (ERASMUS+), Guimarães, 21st of July, 2022, António Baptista, Sandra Franco, Sérgio Teixeira and Manuel Filipe Costa

International Conferences on Applications of Optics and Photonics (AOP), Guimarães, July, 2022. Chairman: Manuel Filipe Costa.

95th IUVSTA Workshop, Plasmonic Thin Films: Theory, Synthesis and Applications, June 20-23, 2022, Guimarães, Portugal, hosts Joel Borges and Filipe Vaz

RIVA 2022 - XII Iberian Vacuum and Applications Conference, 16-17 May, 2022, Braga, Portugal, Charmain Carlos Tavares

Quantum Matter Colloquia - event organized by Bruno Amorim and the Quantum.Matter@PT network, with a series of 9 colloquia

VI International Symposium of Young Optometrists (SIYO2022). University of Valencia. November 14th to 28th. University of Valencia, Spain, 14-28 November, 2022.

Seminar Quantum Agora (online, event organized by Bruno Amorim and Quantum.Matter@PT network: 21 seminars (full list: https://quantummatterpt.weebly.com/qmagora.html)

Quantum Matter | Materials & Concepts Summer School 2022, 3-7 September 2022, Instituto Politécnico de Tomar; Bruno Amorim

Workshops Series

ERASMUS+ Short-term joint staff training events: STEM for Inclusion Classrooms. António Baptista, Sandra Franco and Manuel Filipe Costa. 1st to 4th of February 2022

Awards and achievements

The Physics Center has 7 researchers who are part of the "World's Top 2% Scientists 2022" list,
Carlos Costa, Clarisse Ribeiro, Filipe Vaz, José González-Méijome, Nuno Peres, Pedro Martins and Vasco Teixeira, where are listed the 2% of most influential scientists during the year 2022, according to a study by Stanford University and Elsevier.

Maria José Lima, PSE Early Career Award 2022 (3rd place), 18th International Conference on Plasma Surface Engineering, September 12-15, 2022, Erfurt, Germany

Sérgio Nascimento. General Secretary of the International Colour Vision Society

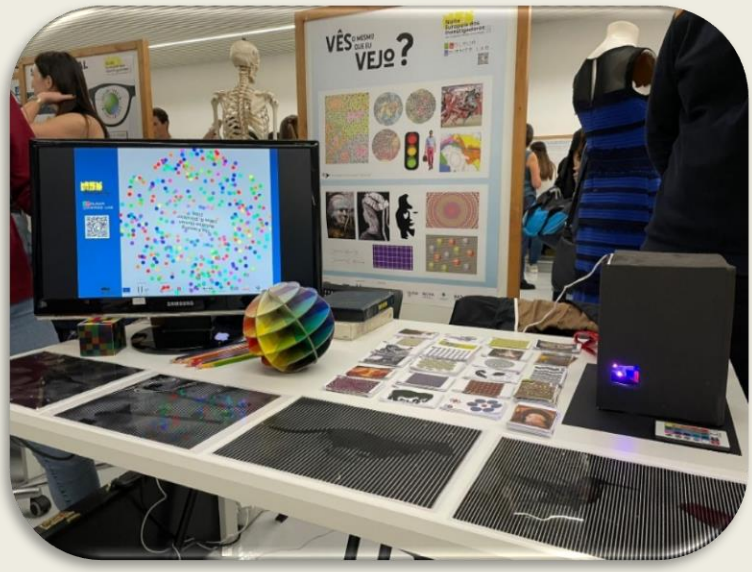
Editorial board members

15 researchers of the Centre are editors or members of editorial committees of Scopus journals

Outreach Activity

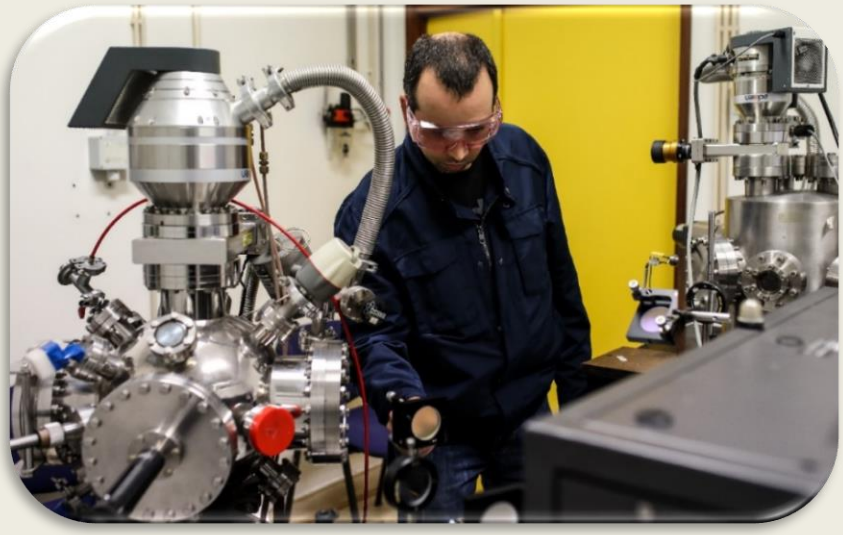
The Centre members participate in several science dissemination activities:
NEI 2022 - European Researchers' Night
IV Journeys of Science
Pint of Science Festival 2022
Researchers go back to school
Toddler's School on Quantum Matter 2022
Best student in UM
Summer in the Campus 2022
10th Hands-on Science Science Fair
Visual screening on World Sight Day 2022

The Members of the Centre also gave 20 lectures in high schools and other research awareness activities, including the presence in radio programs with interviews and participating in the programs "90 Seconds of Science" of radio station Antena 1, "Communicating Science" of radio station Antena Minho and "UMinho R&D" of radio station RUM.



Research Laboratories

Laboratory – location	Research Line	Responsable
Biophysics – Gualtar	2	Paulo José Coutinho
Ceramics Research – Azurém	3	Mário António de Castro Pereira
Computational Physics – Gualtar	3	Luís Silvino Alves Marques
Corrosion and electrochemical testings – Azurém	3	Joaquim Carneiro
Crystal Growth – Gualtar	2	Etelvina de Matos Gomes
Dielectric Properties – Gualtar	2	Bernardo Gonçalves Almeida
Electromechanical properties of materials – Azurém	3	Senen Lanceros-Mendez
Femtosecond Laser Spectroscopy –Gualtar	2	Michael Scott Belsley
Fluorescence Lifetimes - Gualtar	2	Mário Rui da Cunha Pereira
Functional Coatings I – Azurém	3	Martin Andritschky
Functional Coatings II – Azurém	3	Luís Rebouta
Functional Coatings III – Azurém	3	José Filipe Vilela Vaz
Infrared Spectroscopy – Gualtar	2	Luís Manuel Gomes Vieira
Magnetic and Electromechanical Properties – Gualtar	2	Bernardo Gonçalves Almeida
Materials Processing – Azurém	3	Stanislav Lazarov Ferdov
Microtopography – Gualtar	3	Manuel Filipe Costa
Visual Optics and Ophthalmic Instrumentation – Gualtar	1	Sandra Maria Braga Franco



Laboratory – location	Research Line	Responsable
Optoelectronics – Azurem	3	Carlos José Tavares
Photoconductivity – Gualtar	2	Maria de Fátima Cerqueira
Photophysics I – Gualtar	2	Elisabete Coutinho
Photophysics II – Gualtar	2	Elisabete Coutinho
Preparation – Azurém	3	Stanislav Ferdov
Preparation I – Gualtar	2	Elisabete Coutinho
Preparation II – Gualtar	3	Maria de Jesus Matos Gomes
Raman Spectroscopy and Photothermal Measurements – Gualtar	3	Francisco Macedo
Research in Clinical and Experimental Optometry – Gualtar	1	Jorge Jorge/José González Meijome
Science of Vision and Colour – Gualtar	1	João Manuel Maciel Linhares
Surface analysis – Azurem	3	José Filipe Vilela Vaz
Thin Films I – Gualtar	3	Maria Jesus Matos Gomes
Thin Films II – Gualtar	3	Mário António Castro Pereira
Visual Rehabilitation – Gualtar	1	António Manuel Baptista
Electrofisiology	1	José González Meijome / Paulo Fernandes
Applied Optics Laboratory	2	Luis Rebouta
Raman Imaging and 2D Materials and Devices - INL	2	João Pedro Alpuim

Supervision of Research Students

PhD completions in 2022

Ana Lima
Supervised by Pedro Martins, Senentxu Lanceros-Mendez, Yury V. Kolen'ko
"Magnetically responsive inks for printed electronics components and devices: integration into fully printed magnetic sensors"

Bruna Gonçalves
Supervised by S. Lanceros-Mendez, Yury V. Kolen'ko and Gabriela Botelho
"Novel printable photovoltaic systems based on Cu(In,Ga)Se2 chalcopyrite"

Hugo Higino Martins Salazar
Supervised by Stanislav Ferdov, Gabriela Botelho, Senentxu Lanceros-Mendez
"New generation of polymer composite membranes for water purification"

Bruno Alexandre Alves Santos
Supervised by Senen Lanceros Mendez, Margarida Fernandes, Pedro Manuel Abreu Martins
"Multifunctional self-healing photocatalytic and antimicrobial membranes for emerging pollutants water remediation"

Filipe da Costa Correia
Supervised by Carlos Tavares, Adélio Mendes (UPorto)
Desenvolvimento de filmes finos heteroestruturados em ZnO com propriedades termoeléctricas em células solares

Iran da Rocha Segundo
Supervised by Elisabete Freitas, Joaquim Carneiro
Ecological, Photocatalytic, Hydrophobic and Self-Cleaning Road Pavement Surfaces

João Pedro dos Santos Pires
Supervised by João Parente Lopes (FCUP); Bruno.Campos Amorim
Quantum Effects of Impurities and Lattice Defects in Topological Semimetals

Marta Adriana Félix Forte
Supervised by Carlos Tavares, Rui Silva (UAveiro)
Encapsulation of phytonutrients in polymeric microcapsules coated with photocatalytic nano materials

Nelson Miguel Maceda da Silva Pereria
Supervised by Senentxu Lanceros Mendez; Vitor Manuel Correia
Development of multifunctional inks for the implementation of interactive applications

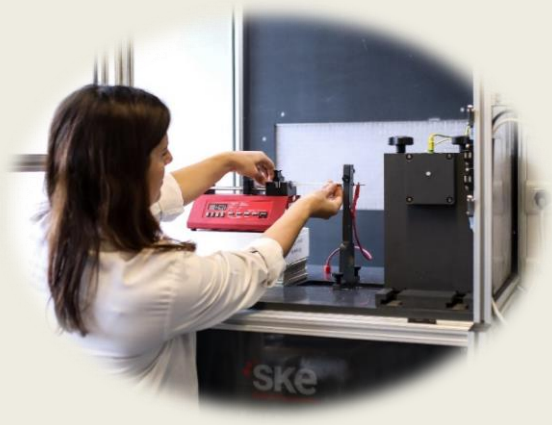
Patrícia Daniela Cabral da Silva
Supervised by Pedro Alpuim, Elisabete Fernandes (INL)
Immuno-field-effect transistor platforms based on 2D materials for early detection of biomarkers of ischemic stroke

Pedro Lima Ramos
Supervised by Antonio Filipe Macedo
Studying prevalence using capture-recapture methods: visual impairment in Portugal

Pelsin Demir
Supervised by Antonio Filipe Macedo
Myopia prevalence and risk factors for myopia progression

Sergio Gonçalves
Supervised by Pedro Branco; Senentxu Lanceros-Méndez; José Gerardo Rocha
New generation of interactive platforms based on novel printed smart materials

Vera Lúcia Alves Carneiro
Supervised by José Manuel González Meijome
Advocacy for Promotion and Integration of Refractive Error Services into National Health Services



PhD projects in progress at December 31, 2022

Name	Supervisor	Title	Doctoral Program
Alshaarawi M. A. Salem	Sandra Franco/ António Baptista	The effect of near vision tasks in the visual system: university students	Optometry and Vision Sciences
Ana Isabel Amorim de Sousa	José González Meijome, António Queirós Pereira e Norberto Gil	Adaptive and Selective Optical Setup for Visual Stimulation: Proof of concept, Experimental Setup and Validation	Optometry and Vision Sciences
André Gustavo Silva de Macedo	Clarisse Ribeiro, S. Lanceros-Mendez, Vanessa Cardoso	Multiresponsive hydrogels as a novel approach for bone cancer therapies	Materials Engineering
Andreia Esteves Gomes	Sérgio M.C. Nascimento e João M.M Linhares	Tuning illumination and colored optical filters for optimal viewing of human skin	Optometry and Vision Sciences
Anita Camillini	Ernesto Galvão (INL), Michael Belsley	Architectures for scalable quantum photonic computing	MAP-Fis
Barbara Daniela Duarte Cruz	S. Lanceros-Méndez; Daniela Correia	Nanoparticle free functional materials for printable sensors	Materials Engineering
Beatriz Dias Cardoso	Elisabete Coutinho, Vanessa Cardoso, S.Lanceros-Méndez	Microfluidic evaluation of drug-loaded magnetoliposomes as multifunctional platforms for advanced cell therapies	Materials Engineering
Belgacem Tiss	Luís Cunha, Diego Martínez	Deposition of UV-protective oxide films on complex substrates: cork and rubber.	Materials Engineering
Bruna Machado da Silva	Bernardo Almeida, João Pedro Araújo, Armandina Lopes	Naturally Layered Perovskyte Heterostructures	MAP-Fis
Bruno Rodrigues Pacheco e Murta	Joaquín Fernandez Rossier, Nuno Miguel Machado Reis Peres	Quantum Many-Body Ground States via Digital Quantum Simulation	MAP-Fis
Catarina Oliveira	Jeff Th. M. De Hosson/Diego Martinez-Martinez/Luís Cunha	Deposition and characterization of sputtered Zr-O-N based films for fine tuning of their physical properties	Materials Engineering
Celso Joel Oliveira Ferreira	Bruno F. C. Silva, Cláudia Botelho (CEB), M. Elisabete R. Oliveira	Microfluidics for size-controlled cationic liposome-DNA complexes: going beyond the universal transfection curve	MAP-Fis
Daniela Morais	Vítor Vilar e Francisca Moreira (FEUP), Carlos JTavares	A continuous - flow photoelectrocatalytic static mixer microreactor applied to the synthesis of high-value organic chemicals	Chemical and Biological Eng. (FEUP)
Diana Isabela Meira	Filipe Vaz, Joel Borges, Vitor Correlo (ICVS/3B's)	Development of nanoplasmonic thin film biosensors with enhanced sensitivity for detection of Ochratoxin-A.	MAP-Fis
Diogo Emanuel Carvalho Costa	Filipe Vaz, Paula Sampaio (CBMA), Graça Minas (DEI)	Development of optical (T-LSPR) biosensors, based in nanoplasmonic thin films, for fast Legionella pneumophila detection in patients or environmental samples	MAP-Fis
Diogo Filipe Pinto Cunha	Mikhail Vasilevskiy	Theory and modeling of two-dimensional materials and hybrid structures for nano-photonics	MAP-Fis
Dora Nazaré Marques	Sérgio M.C. Nascimento e João M.M Linhares	Environmental spectral statistics and brain plasticity – testing hypotheses about the mysterious vision of X-linked forms of colour vision deficiencies	Optometry and Vision Sciences
Eduarda Barbosa Fernandes	Marlene Lúcio, Vanessa Cardoso, S. Lanceros-Méndez	BIOMYSKIN – Biomimicry profiling supporting drug discovery for topical applications	Materials Engineering
Eduardo Ínsua Pereira	Madalena Lira e Paula Sampaio	Evaluation of cytotoxic potential and inflammatory response induced by contact lenses	Optometry and Vision Sciences
Eduardo José de Sousa Pimentel	Carlos Costa, Daniel Miranda, S. Lanceros Mendez	Printable piezoresistive materials based on natural polymers for medical device applications	Materials Engineering
Elmahdi Amar	Nicoleta Nicoara (INL), Pedro Alpuim	Characterization do single-photon emitting defects in 2D materials by scanning probe microscopy	MAP-Fis
Estela Marisa Oliveira Carvalho	Margarida Fernandes, Clarisse Ribeiro, S. Lanceros-Mendez	Improving Titanium-Bone interfaces with electroactive and antimicrobial materials for effective orthopedic implants	Materials Engineering
Fábio Alberto Costa Lopes	Paulo J. G. Coutinho, Ana Rita Rodrigues, Paula Campelo	Development of multifunctional magnetic/plasmonic nanosystems for combination therapy and radiosensibilization	Materials Engineering
Francesco Viviano	José M. González Méijome, Rute Araújo	Scleral lens fitting in keratoconus patients	Optometry and Vision Sciences
Francisca Marçal Pinheiro Guedes	Mário Rui Pereira, Susana Costa (DQ), Martin Lopez Garcia (INL)	Novel quantum materials inspired by natural photonic photosynthetic structures	Applied Chemistry
Gonçalo Catarina	Nuno Peres	Correlated electronic phases in low-dimensional materials	MAP-Fis

Henrique Emanuel Silva	Andreia Gomes (CBMA), Marlene Lúcio	2G4CANCER – Green graphene/lipid nanosystems for cancer imaging and treatment	Molecular and Environ. Biology
Iñaki Blanco Martínez	José M. González Méijome, Paulo R. Botelho Fernandes.	Off-axis wavefront model of young and ageing human eyes	Optometry and Vision Sciences
Irina Soraia Rainho Rio	Paulo Coutinho, Elisabete Coutinho, Fátima Baltazar (ICVS)	Lipid nanocarriers containing magnetic/gold nanoparticles coated with mesoporous silica for application in SCC skin cancer therapy	Materials Engineering
Isabel Alves Lopes	Rui Vilar e Luís Rebouta	Optical and tribological properties of femtosecond laser nanotextured surfaces	AdvaMTech
James Caleb Peters	Pedro Alpuim, Leonard Francis (INL)	Correlation do transport and structural properties do Graphene and Bismuth Telluride as a function CVD growth parameters	MAP-Fis
Jessica Gomes	Sandra Franco	Real-time changes in ocular optical properties with accommodation	Optometry and Vision Sciences
Joana Catarina Dias Moreira	S. Lanceros-Méndez; M.M. Fernandes; v	Physical active antimicrobial surfaces for preventing the spread of pathogenic microorganisms	Materials Engineering
Joana Margarida da Silva Ribeiro	Carlos J Tavares, Torbel Boll (KIT, Germany)	Transparent thermoelectric titanium dioxide-based thin films for thermal energy harvesting	Materials Engineering
Joana Marina Silva Queirós	S. Lanceros Mendez; Pedro Martins	Wide range polymeric membranes towards water remediation of contaminants of emerging concern	Materials Engineering
João Carlos Pacheco Barbosa	Carlos M. Costa, S. Lanceros Mendez	Development of three component solid-polymer electrolytes for energy storage applications	Materials Engineering
João Luís Rodrigues Teixeira	S. Lanceros Mendez, Gabriela Botelho e Pedro Manuel Martins	Multifunctional air filters based on emerging natural polymers for VOCs removal	Materials Engineering
João Miguel Peixoto Oliveira	Bernardo Almeida, Leonard Francis (INL)	Multiferroic bilayer composites for coupled magnetic-electric-optical functionalization	MAP-Fis
João Pedro Cruz Serra	Carlos Costa, Pedro Costa, S. Lanceros Mendez	Natural polymer based multifunctional materials for sensing applications	Materials Engineering
Jorge Manuel Pereira de Sousa	Elisabete Freitas/Joaquim Carneiro	Incorporation of Composite Phase Change Materials into Asphalt Mixtures for Cooler Pavements	Civil Engineering
José Alexandre Monteiro	João M.M Linhares e Sérgio M.C. Nascimento	Neural networks applied to the preservation and restoration of artistic paintings.	Optometry and Vision Sciences
José Diogo Guimaraes	Mikhail Vasilevskiy, Luís Brabosa	Investigation of quantum effects on energy and charge transport in photosynthetic systems using quantum simulations	MAP-Fis
Juliana Filipa Gouveia Marques	Carlos J Tavares	Difusão controlada de compostos ativos do interior de microcápsulas mediada por ativação solar	Materials Engineering
Laura Hernández Moreno	António Filipe Macedo e João M.M Linhares	Cost-effectiveness of basic vision rehabilitation in Portugal	Optometry and Vision Sciences
Liliana Sofia Fernandes	S. Lanceros-Mendez, Pedro Libânio Martins, Daniela Correia	Magnetic ionic liquid/polymer composites for printable sensors and actuators	Materials Engineering
Lina María Rodríguez Cely	José M. González Méijome e António Queirós	Corneal and refractive parameters with impact in contact lens fitting in Colombia and Portugal	Optometry and Vision Sciences
Luis Amaro Ribeiro Martins	José Luis -Ribelles, S. Lanceros-Mendez, Clarisse Ribeiro	Microfluidic processing of Smart polymers for Tissue Engineering	Un. Politecnica de Valencia
Luis Proença Oliveira	Jorge Jorge	Estudo da influencia da Visão no atletismo	Optometry and Vision Sciences
Mafalda Inês Abrantes	João Pedro Santos Hall Agorreta Alpuim, Luís Ricardo Jacinto	Graphene nanobioelectronics for neural interfacing	Materials Engineering
María Mechó García	José M. González Méijome, Rute J. Macedo de Araújo	Statistical wavefront model of accommodation: analysis and synthesis	Optometry and Vision Sciences
Maria João Fernandes Faria	Marlene Lúcio, M. Elisabete Oliveira, G. Carracedo	MeYeDEAR – Monoolein-based EYE DElivery systems for Age-related Retinopathies	Optometry and Vision Sciences
Maria Manuela Carvalho Proença	Filipe Vaz, Joel Borges	Nanoplasmonic thin films of Au-Ag/MOx functionalized with molecular recognition elements to enhance sensitivity and selectivity of LSPR gas sensors	MAP-Fis
Marina Alves	Joaquim Carneiro, Sascha Sadewasser (INL)	Fabrication and characterization of micro-concentrator solar cells based on Cu(In,Ga)Se2	Materials Engineering
Marta Sofia Vilela Barreira Teixeira	Alice Carvalho (CQUM), Elisabete M. S. Castanheira Coutinho	Development of a drug carrier nanosystem for a new anticancer drug and optimization of the new drug	Chemistry
Maurício Quintela	Nuno Peres	Excitons in 2D Materials	MAP-Fis

Miguel Alexandre Franco	S. Lanceros Mendez, Asal Kiazadeh	Development of printed and biocompatible synaptic devices	Materials Engineering
Nelsom Cunha	José Carlos Gomes, Luis Rebouta	Design and construction of a Rangefinder/LiDAR testbed	MAP-Fis
Patrícia Pereira-Silva	Joel Borges, Paula Sampaio (CBMA)	Development of nanocomposite ZnO thin films with antibiofilm and antimicrobial properties to prevent pathogens' transmission.	Molecular and Environ. Biology
Pedro Tiago Jesus	Jorge Jorge	O Efeito da compensação das disfunções acomodativa/vergenciais na progressão da miopia	Optometry and Vision Sciences
Rafael dos Santos Pinto	Carlos Costa, Senentxu Lanceros-Mendez, Renato Gonçalves	Two- and three-dimensional sustainable solid-state printed batteries for portable electronic devices	Materials Engineering
Rafael Wagner	Ernesto Galvão, Rui Soares Barbosa (INL), Mikhail Vasilevskiy	Coherence and contextuality as quantum resources	MAP-Fis
Rafaela Marques Meira	Clarisse Ribeiro, Senentxu Lanceros-Mendez, Daniela Correia	Electroactive polymer materials based heart-on-a-chip as a novel approach for cardiac tissue engineering	Materials Engineering
Raquel Gaudência Dias Andrade	Elisabete Coutinho, M. Côrte-Real (CBMA), Lígia Rodrigues (CEB)	Functionalized magnetoliposomes for enhanced anticancer activity of lactoferrin against triple negative breast cancer cells	Materials Engineering
Ricardo Jorge Brito Pereira	Vanessa Cardoso and Senentxu Lanceros-Méndez	A new generation of microfluidic platforms based on smart and multifunctional materials	Materials Engineering
Ricardo Jorge Cunha Fernandes	Paulo J. G. Coutinho, Luciana Pereira (CEB)	Photocatalytic degradation of PFAS under visible light: development of nanomaterials as novel photocatalysts and process scale-up	Materials Engineering
Ricardo José da Silva Lima	Pedro Costa, João Pereira, Senentxu Lanceros-Mendéz	Advanced self-sensing polymer composites with self-healing capabilities for high responsibility applications	Materials Engineering
Rita Maria Martins Alves	Fernanda Cássio, Madalena Lira, Ana Vera Machado	Contact lens materials: An ecosystem issue and a contribution to a circular economy	Molecular and Environ. Biology
Rita Policia	Pedro Martins, D. Correia, Senentxu Lanceros-Mendez	High-performance printable luminescent and chromic materials for improved device integration	Materials Engineering
Rui Guilherme Silva	Paulo Mendes (CMEMS), Pedro Alpuim	Software Defined Antenna for THz Applications	Electrical Engineering
Rui Miguel Carvalho	Pedro Martins, S. Lanceros Mendez, Joaquim Moreira	SuSprinting: Sustainable materials and technologies for printable spintronic applications	Materials Engineering
Salomé Aurora Pereira.	Paulo Fernandes	Objective Eye Care Measurements Obtainment with Eyetracker and their Influence on Ophthalmic Lens Adaptation	Optometry and Vision Sciences
Sérgio Rafael da Silva Veloso	Elisabete Coutinho, P.M.T. Ferreira, Miguel -Duarte (U.Vigo)	Development of multifunctional supramolecular magnetogels for multimodal cancer therapy	MAP-Fis
Telma Campos Domingues	Pedro Alpuim, Jérôme Borme (INL), Bruno Costa (ICVS-UM)	Multiplex detection of circulating tumor DNA using graphene electrolyte-gate field-effect transistors	MAP-Fis
Teresa Marques-Almeida	Clarisse Ribeiro, S. Lanceros-Mendez, Hugo Fernandes	Biodegradable electroactive polymer materials as a novel approach for neural tissue engineering applications	Materials Engineering
Tiago A. Queirós	Jana Nieder (INL), Pedro Alpuim	Single Photons on-Demand from a 2D Materials Heterostructure	MAP-Fis
Tiago André Marinho	Pedro Costa, Vitor Correia, S. Lanceros Mendez	Printable energy harvester systems for wearable sensors devices	Materials Engineering
Tiomthy Albert	José M. González Méijome, Rute Araújo	Validation of an Italian Language Vision-Related Quality of Life Questionnaire and Evaluation of Corneal and Retinal Modifications in Patients with Keratoconus	Optometry and Vision Sciences
Vítor Filipe da Silva	Paulo Mendes (DEIC-UM), Pedro Alpuim	RF graphene technology oscillators for biomedical devices	Electrical Engineering
Viviana Lima de Sousa	Pedro Alpuim, Yuri Kol'enko (INL)	Unconventional Thermoelectrics Based on Self-Organized Nanocrystal Superlattices	Materials Engineering
Yelko del Castillo Hernández	Joaquín Fernandez Rossier, Nuno Miguel Machado Reis Peres	Single spin resonance magnetometry with scanning tunneling microscopy	MAP-Fis

Master theses completed in 2022

Name	Supervisor	Title	Master Course
Ana Filipa Lopes Bago Rodrigues	Sandra Franco	Comportamento ótico de materiais expostos a radiação UV-C	Advanced Optometry
Adriana Ribeiro	Sandra Franco, Miguel Faria Ribeiro	Avaliação da função visual após implante de LIO's monofocais de foco alargado.	Advanced Optometry
Alcinda Valéria Gomes da Silva	Elisabete Coutinho; Paula M. T. Ferreira (CQUM)	Multifunctional magnetic nanolipogels based on peptide hydrogels for application in combined cancer therapy	Biophysics and Bionanosystems
Alexandre Silva	Luís Marques, Veniero Lenzi	Study of friction mechanisms between texturized surfaces	Physics
Ana Carolina Duarte	Carlos Tavares e Sasha Sadewasser (INL)	Fabrication of CuInSe2 micro and nano-concentrator photovoltaics (nCPV)	Materials Engineering
Ana Cristina Marques Ribeiro	Paulo J. G. Coutinho; Juan Gallo (INL)	Magnetic hyperthermia assisted genetic amplification	Biophysics and Bionanosystems
Ana Isabel Antunes Gonçalves	Clarisse Ribeiro, Daniela Correia	Desenvolvimento e comparação de estruturas sustentáveis e ativas para engenharia de tecido cardíaco	Biophysics and Bionanosystems
Ana Margarida Macedo Veloso Barros	Ana Rita Rodrigues; Paulo J.G. Coutinho	Magnetolipossomas plasmónicos contendo nanovaras de ouro para aplicação em terapia dual do cancro	Biophysics and Bionanosystems
Ana Rita Faria Pacheco	Elisabete M. S. Castanheira Coutinho; Ana Rita Rodrigues	Desenvolvimento de magnetolipossomas sensíveis ao pH contendo nanopartículas magnéticas anisotrópicas para aplicações em terapia dual do cancro	Biophysics and Bionanosystems
Ana Rita Magalhães Vieira	Sandra Franco, João Linhares	Efeitos de filtros de luz azul no sistema visual.	Advanced Optometry
Ana Sofia Castro	Daniela Correia, Pedro Martins	Desenvolvimento de membranas sustentáveis para remediação ambiental	Environmental Sciences and Technologies
Ângelo Jorge da Silva Pereira	Paulo J. G. Coutinho; Vânia Salgado	Conceção de uma Central Fotovoltaica	Environmental Sciences and Technologies
Carlos Rafael Peixoto Monteiro	Mário A. C.C. Pereira/ José P. B. Silva	Filmes finos ferroelétricos relaxadores para o armazenamento de energia	Materials Engineering
Catarina Micaela Martins Coelho	Gil Fortes (DQ), Elisabete M. S. Castanheira Coutinho	Plants extracts: isolation, synthesis of derivatives, nanoencapsulation and biological evaluation for potential application as biopesticides	Applied Biochemistry
Cipriano	Gabriela Botelho, Daniela Correia	Membranas poliméricas para remediação ambiental	Characterization Techniques and Chemical Analysis
Cristiana Micaela Rodrigues Marques.	João M.M. Linhares	"O efeito da radiação UVC em materiais óticos"	Advanced Optometry
Cristiano Viães	Luís Marques, Sandra Mariana Marques	Development of multifunctional dental implants	Biophysics and Bionanosystems
Daniela Filipa Magalhães dos Santos	Bernardo Almeida, Rosa Baptista	Nanofibras funcionalizadas com dipéptidos nanoestruturados para aplicações em biossensores	Biophysics and Bionanosystems
Diana de Brito Sousa	Martin Andritschky e Mariana Marques	Revestimentos decorativos e funcionais em substratos poliméricos em substratos poliméricos para a indústria automóvel usando uma tecnologia eco-friendly	Materials Engineering
Diana Sofia Azevedo de Oliveira	Carlos Tavares e Nicoleta Nicoara (INL)	Impacto do tratamento alcalino pós-deposição alcalino na interface Cu(In,Ga)Se2/Mo de uma célula solar na forma de um filme fino	Materials Engineering
Diana Tavares Mesquita	Fatima Cerqueira/UM e António Vilanova (INL)	Preparação, otimização e caracterização avançada das camadas principais de células solares de perovskita	Micro e Nanotechnologies
Diogo Francisco Veiga Baptista	Paulo Mendes (DEIC), Pedro Alpuim	Radiofrequency Circuits Based on Graphene Technology	Engineering Physics

Eliana Isabel Ferreira da Silva	João M.M. Linhares	"Avaliação da estrutura das Glândulas de Meibomio"	Advanced Optometry
Fábio Alberto da Costa Lopes	Ana Rita Rodrigues; Paulo J. G. Coutinho	Desenvolvimento de (magneto)lipossomas inteligentes contendo nanopartículas compósitas de ferrite e ouro para aplicação em terapia multimodal do cancro	Biophysics and Bionanosystems
Fábio Manuel Ratana Rodrigues	Clarisse Ribeiro, Senentxu Lanceros-Mendez	Micro-estruturas híbridas eletroativas para a regeneração da medula espinal	Biophysics and Bionanosystems
Filipa Margarida Barbosa Gomes	Sandra Franco	Efeitos de filtros de luz azul na acomodação ocular	Advanced Optometry
Filipe Miguel Gonçalves da Silva	Madalena Lira	Influência da película lacrimal na medição da pressão intraocular	Advanced Optometry
Francisco Manuel Macedo Conceição	Carlos Tavares e Frank Bergman (Nemho)	Lignin structures and properties impact on the impregnation of LPF resins on kraft paper for further HPL production	Materials Engineering
Gonçalo Filipe Frederico Meneses Moreira	Bernardo Almeida, Rosa Baptista	Nanofibras funcionalizadas com perovskites orgânicas e inclusões magnéticas	Materials Engineering
Gonçalo João Costa Carvalho	Manuel Filipe Costa	Eficiência Energética em edifícios: Estudo energético de melhoria do desempenho energético para o edifício do Laboratório da Paisagem	Environmental Sciences and Technologies
Graciete da Silva Santos	João M.M. Linhares	"Análise comparativa da visão das cores periférica"	Advanced Optometry
João Dinis Alves	Pedro Martins, Daniela Correia	Membranas multicamada para a purificação de água obtidas por impressão 3D	Materials Engineering
João Duarte Gonçalves Azevedo	Jana Nieder (INL), Pedro Alpuim	Graphene-DNA origami-based nano-electro-mechanical-system	Engineering Physics
João Filipe Vale Castro	Manuel Filipe Costa	Reaproveitamento de constituintes de painéis fotovoltaicos	Environmental Sciences and Technologies
João Manuel Alendouro Oliveira Pinho	João Manuel V. Parente Lopes (FCUP); Bruno A. C. Amorim (CF-UM-UP)	From Bloch Oscillations to Stationary Currents in Mesoscopic Systems	Physics (UP)
Jorge Miguel Fernandes da Cunha	Elisabete M. S. Castanheira Coutinho; Sérgio F. Sousa (Fac. Medicina da UP)	Computational Development of New Biocatalyst for Plastic Degradation through QM/MM Methods	Biophysics and Bionanosystems
José Nuno Rocha Gama	Martin Lopez (INL), Pedro Alpuim	Integration do 2D Materials on Biomimetic Photonic Structures	Engineering Physics
Luís Manuel Abreu de Sousa	J. M. Oliveira, João Linhares, Fernando Almeida e João Cerqueira.	"Influência das operações pós-fermentativas na cor de vinhos"	
Márcia Francisca Ferreira Paulos	Paulo J. G. Coutinho	Fotoconversão da água em hidrogénio através de nanoplacas de g-C_3N_4 poroso acoplado a nanopartículas de prata e usando poluentes modelo como doadores sacrificiais	Environmental Sciences and Technologies
Maria Beatriz Santos	Sandra Franco	Repetibilidade e reprodutibilidade de exames para avaliação da acomodação ocular	Advanced Optometry
Maria Madalena Sousa da Silva	Elisabete M. S. Castanheira Coutinho; Lorena Diéguez (INL)	Preclinical validation of an optofluidic system for the detection of minimal residual disease in Acute Myeloid Leukemia	Biophysics and Bionanosystems
Mélanie Rodrigues Pereira	Elisabete M. S. Castanheira Coutinho; Cátia Pereira (CEB)	Multifunctional liposomes containing magnetic and gold nanoparticles as nanocarriers for lactoferrin	Biophysics and Bionanosystems
Miguel Sá	Eduardo Filipe V. Castro (FCUP); Bruno A. C. Amorim (CF-UM-UP)	Theoretical description of angle-resolved photoemission spectroscopy of low twist angle van der Waals multilayers	Physics (UP)
Nicola Gabriel Russell Ferreira	Clarisse Ribeiro, Sylvie Ribeiro	Photothermal materials based on electroactive polymers for skin cancer treatment	Materials Engineering
Patrícia Alexandra Vieira Nogueira	Sandra Franco	Estudo dinâmico e em tempo real da acomodação em disfunções acomodativas	Advanced Optometry
Paula De Sousa Ferreira	Sandra Franco	Terapia visual em disfunções acomodativas	Advanced Optometry

Rafael Alexandre Antunes Vilarinho	Martin Lopez (INL), Mário Rui Pereira	Natural growth of light harvesting nanostructures from microalgae for bioinspired energy solutions	Engineering Physics
Rafael Cerqueira	Bernardo Almeida	Filmes nanoestruturados de niquelites de terras raras	Physics
Rafael Gomes Costa	António Queirós, Paulo Fernandes	Avaliação do nível de conhecimento dos profissionais de saúde da visão sobre as técnicas de controlo de progressão da miopia	Advanced Optometry
Ricardo Francisco de Oliveira	Eduardo Filipe V. Castro (FCUP); Bruno A. C. Amorim (CF-UM-UP)	Superconductivity in quasiperiodic systems and magic-angle semimetals	Physics (UP)
Ricardo Jorge Rodrigues Costa	Ana Rita Rodrigues; Paulo J. G. Coutinho	Nanossistemas lipídicos contendo nanopartículas magnéticas/sulfureto de cobre para terapia multimodal do cancro	Biophysics and Bionanosystems
Rita Clarisse da Silva Barbosa	Paulo Mendes (DEIC), Pedro Alpuim	Simulation and design of a photoacoustic nanotechnology-based ultrasound probe for biomedical applications	Biomedical Engineering
Rita Maria Serra Seco	Rute Araújo	Alterações da espessura do reservatório lacrimal e na qualidade ótica ao longo de um dia de uso de lentes esclerais	Advanced Optometry
Rui Miguel Gonçalves Carvalho	Pedro Libânio Martins, S. Lanceros Mendez,	Tintas magneticamente ativas para recolha e gestão energética	Environmental Sciences and Technologies
Samantha Faria Oliveira da Costa	Ana Rosa Ribeiro (INL), Cacilda Moura	Development of a skin on a chip device for toxicological evaluation of nanomaterials	Biophysics and Bionanosystems
Samuel Lopes Rocha	Mário Rui Pereira, Daniel Souto Rodrigues (DEC-UM)	Ilhas de Calor na cidade de Braga – localização e estudo dos impactos no consumo de energia resultantes da sua mitigação	Environmental Sciences and Technologies
Silvana Filipa Ferreira Coelho	António Queirós, Paulo Fernandes	Estudo sobre o nível de informação da população portuguesa relativamente às técnicas existentes para controlo da progressão da miopia	Advanced Optometry
Sónia Raquel Martins Fernandes	Sandra Franco	Efeito da iluminância na acomodação ocular	Advanced Optometry
Tiago Rodrigues	Bernardo Almeida, Etelvina Matos Gomes	Micro- e Nanofibras combinando materiais ferromagnéticos e ferroelétricos por electrospinning	Physics
Tomás Torres Martins	Rosana Alves Dias (INL), Pedro Alpuim	Development do 3-axis MEMS magnetometers based on Lorentz force	Engineering Physics
Vasco Daniel Ferreira Peixoto	M. Bañobre-Lopéz (INL); Elisabete M. S. Castanheira Coutinho	Addressing tumor chemotherapy resistance through smart drug delivery	Biophysics and Bionanosystems

Externally funded projects

Projects finished in 2022

In 2022, 25 research projects were completed with CF-UM-UP as a partner

Funding entity	Title	Researcher	Global Budget - UM
FCT	The synergy between texturing and self-lubricating coatings for more energy-efficient and environmentally friendly mechanical contacts - Atrito-0 – PTDC/EME-SIS/30446/2017	Luís Silvino Marques	75 206,25 €
FCT	Defect Engineering in rare-earth nickelate thin films towards active magnetic and optical metamaterials DEMOM - PTDC/NAN-MAT/28538/2017	Bernardo Almeida	46 012,50 €
FCT	The Optimal Challenges in Irrigation To CHAIR - PTDC/MAT-APL/28247/2017	Sofia Oliveira Lopes	168 785,31 €
FCT	Mid- and far-infrared plasmonic biosensing with graphene PTDC/FIS-MAC/28114/2017	Nuno Peres	78 211,01 €
FCT	Non Linear Optical Properties of Layered Materials - NLINOP2DMAT - PTDC/FIS-MAC/28887/2017	Nuno Peres	27 010,12 €
FCT	Optical and biometric lens changes with accommodation and their impact on subjective retinal image quality. - LensUM -PTDC/FIS-OTI/31486/2017	Sandra Franco	184 658,12 €
FCT	Development of advanced strategies and solutions for muscle tissue engineering based on electromechanical microenvironments - PTDC/BTM-MAT/28237/2017	Clarisse Ribeiro	220 458,12 €
FCT	Design of new antimicrobial osseointegrated dental implants PTDC/CTM-REF/30708/2017	Luís Silvino Marques	182834.91 €
FCT	CONCERT –Silk-coated honeycomb nanocarriers for cancer therapy - PTDC/NAN-MAT/32651/2017	Marlene Lúcio	238 120,65 €
FCT	Towards high speed optical devices by exploiting the unique electronic properties of engineered 2D materials PTDC/NAN-OPT/29265/2017	Michael Belsley	234 301,87 €
FCT	Functional laticce instabilities in naturally layered perovskites FLIP - PTDC/FIS-MAC/29454/2017	Bernardo Almeida	55 543,45 €
FCT	Plasmonic Nanoparticles for Bio-Detection PTDC/FIS-MAC/32299/2017	José Filipe Vaz	117 558,20 €
FCT	Control of Port and Douro Wines authenticity using graphene DNA sensors - PTDC/BIA-MOL/31069/2017	João Pedro Alpuim	43 712,50 €
FCT	Optical Nanorulers for Super Resolution Microscopy & Sensing PTDC/NAN-OPT/29417/2017	João Pedro Alpuim	31 737,50 €
FCT	MicroTreat - Biomimetic microenvironment for the study and development of targeted therapies in hematological malignancies PTDC/EMD-EMD/28159/2017	Vanessa Cardoso	123 894,29 €
FCT	Advanced Green Printed Batteries for Portable Devices PTDC/FIS-MAC/28157/2017	Carlos Costa	210 158,12 €
FCT	Rational design of Self-Assembling networks for TRansparent electrode Applications - PTDC/CTM-REF/28108/2017	Luís Silvino Marques	164 707,40 €
ANI	Mobilize Technological Skills in Surface Engineering - On-Surf POCI-01-0247-FEDER-024521	José Filipe Vaz	478 235,35 €

FCT	Efficient Simulation and Computation for Health, Sea and Industry PTDC/MAT-APL/28118/2017	Stéphane Clain	154 045,62 €
FCT-Bilateral	W-doped VO2 thin films with 3D Janus-like nanoarchitectures for energy-efficient functional glasses	José Filipe Vaz	3 000,00 €
FCT-Bilateral	Development of ferroelectric-semiconductor heterostructures with embedded plasmonic nanoparticles for high efficiency solar cells FCT-CNRS	José Pedro Silva	3 000,00 €
ANI	Nanomagnetic solutions for oncology therapy MAG4Biomed - 42852	Elisabete Coutinho	12 087,14 €
European Commission	From literacy to digital and technological training innovative and customizable training itinerary to facilitate employability and inclusion of adult - 2019-1-ES01-KA201-065750	António Mário Almeida	13 382,00 €
European Commission	Vet students into technology companies: a vet students mobility network in the technological sector through a virtual environment with specific materials for critical thinking 2019-1-ES01-KA202-064569	António Mário Almeida	11 457,85 €
European Commission	KA201-61C10070 2020-1-PT01-KA201-078451	António Manuel Baptista	29 940,00 €

Projects in progress at December 31, 2022

33 projects with CF-UM-UP as a partner, which worked in 2022, are still active in 2023:

Funding entity	Title	Researcher	Start date	End date	Global Budget - UM
European Commission	International Network on Ionic Liquid Deep Eutectic Solvent Based Metal Organic Frameworks Mixed Matrix Membranes. INDESMOF - 778412	Carlos Costa	01/03/2018	31/08/2023	166 500,00 €
ANI	Smart textiles with photocatalytic microcapsules - ReleaseME - 33268	Carlos José Tavares	01/08/2019	30/06/2023	301 959,36 €
ANI	Development of multifunctional dental implants - ORAIDEA - 39985	Luís Silvino Marques	01/07/2020	30/06/2023	114 101,17 €
ANI	Green Vacuum Coatings – Ecological Metallization of Plastics - GREENCoat - 42785	Martin Andritschky	01/09/2019	31/03/2023	319 819,47 €
European Commission	Graphene Flagship Core Project 3 - 881603	Nuno Peres	01/04/2020	30/09/2023	202 400,00 €
ANI	Manufacturing of cutting tools for the 21st century: from nanoscale material design to numerical process simulation 45940 - MCTools21	Luís Silvino Marques	01/04/2020	31/03/2023	258 535,27 €
ANI	Nanomaterials for wearable-based integrated biostimulation - 45908 - NanoStim	José Filipe Vaz	01/01/2020	1/04/2023	252 003,39 €
ANI	Graphene-enhanced Electro-Magnetic interference Shielding GEMIS- POCI-01-0247-FEDER-045939	Nuno Peres	01/06/2020	31/05/2023	250 004,41 €
ANI	Development of Nanostructured Coatings for Functionalization of Surfaces in Automotive Parts - I4REV - 042783	Luis Rebouta	19/02/2020	30/06/2023	143 524,79 €
ANI	Development of smart clothing to prevent the occurrence of pressure ulcers - 4NoPressure - 39869	Carlos José Tavares	01/06/2020	30/06/2023	82 549,60 €
FCT	Improvement of carbon-based coatings with low rate of secondary electrons CERN/FIS-TEC/0039/2019	Maria Fátima Cerqueira	01/07/2020	30/06/2023	4 750,00 €
European Commission	Opto-Biomechanical Eye Research Network - OBERON - 956720	José González Meijome	01/01/2021	31/12/2024	721 680,48 €
FCT	Electric-Field Engineered Lattice Distortions (E-FiELD) for optoelectronic devices - PTDC/NAN-MAT/0098/2020	Bernardo Almeida	01/01/2020	28/03/2024	61 986,47 €
FCT – PE	CF-UM-UP Strategic Project - Base Funding - UIDB/04650/2020	Luís Rebouta	01/01/2020	31/12/2023	1 052 616,28 €
FCT - PE	CF-UM-UP Strategic Project - Programmatic Funding - UIDP/04650/2020	Luís Rebouta	01/01/2020	31/12/2023	496 616,96 €
ANI	New mosquito repellent solutions with application to Malaria control. REPEL+-47036	Carlos José Tavares	01/06/2021	30/06/2023	296 556,88 €
FCT	Nanomaterials Applied on Innovative Road Pavements for Air-Cleaning PTDC/FIS-MAC/6606/2020	Joaquim Carneiro	29/03/2021	28/03/2024	249 531.73 €

FCT	Films On Cork & Rubber PTDC/CTM-REF/0155/2020	Diego Martínez Martínez	1/02/2021	31/01/2024	202 719.44 €
ANI	Advanced Decision Making in productive systems through Intelligent Networks", (ADM.IN).- POCI-01-0247-FEDER-055087	Luis Rebouta	1/04/2021	30/06/2023	283 160.91 €
Dopavision GmbH	MyopiaX Treatment for the Reduction of Myopia Progression in Children and Adolescents: Safety and Efficacy Investigation	José Manuel González Meijome	27/09/2021	31/12/2025	140 811.09 €
FCT	Quantum Non-equilibrium excitons in two-dimensional semiconductors EXPL/FIS-MAC/0953/2021	Bruno Amorim	10/01/2022	09/07/2023	49 946.38 €
FCT	Color Vision Test supported by neural networks. - EXPL/FIS-OUT/0398/2021	João Manuel Linhares	1/01/2022	30/06/2023	49 934.55 €
FCT	Plasmon-Enhanced Photosynthetic Microalgae Growth for CO2 Bio-Mitigation - EXPL/CTM-REF/0750/2021	Joel Nuno Pinto Borges	1/01/2022	30/06/2023	49 994.99 €
FCT	Self-Assembling networks for TRansparent electrode APplications - PLasma UnSealing EXPL/FIS-MAC/0947/2021	Marta Ramos	17/01/2022	16/07/2023	49 993.99 €
FCT	Coaxial Microfibers Embedded with Phase Change Materials for Road Paving EXPL/EQU-EQU/1110/2021	Manuel Filipe Costa	25/07/2022	24/07/2023	49 912.30 €
FCT	Excitations in 2D Materials PTDC/FIS-MAC/2045/2021	Ricardo Ribeiro	1/01/2022	31/12/2024	49 163.95 €
FCT	Designing superior CIGSe solar cells through understanding and controlling growth - PTDC/CTM-CTM/2241/2021	Maria Fátima Cerqueira	1/01/2022	31/12/2024	69 472.05 €
ANI	Nanomaterials applied in muscle rehabilitation of the elderly using Artificial Intelligence POCI-01-0247-FEDER-046985	José Filipe Vaz	1/07/2021	30/06/2023	526 191.03 €
FCT	Advanced Materials and design rules for interface engineering tOwards a New Generation of Li-Ion Batteries MIT-EXPL/TDI/0033/2021	Carlos Costa	1/03/2022	31/05/2023	47 890.00 €
Precilens	Clinical Study to evaluate the clinical efficacy of DRL orthokeratology lenses compared to SV monofocal ophthalmic lenses	António Queirós Pereira	16/02/2022	15/02/2025	44 913.00 €
FCT-Bilateral	Tailoring multifunctional nano-filters for waste water remediation - CTA_PT/Serbia	Margarida Maria Fernandes	1/01/2020	30/06/2023	4 000.00 €
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FCT	Laboratory of Physics for Materials and Emerging Technologies -LA/P/0095/2020	Luis Rebouta	1/01/2021	31/12/2025	216 148.62 €

Patents

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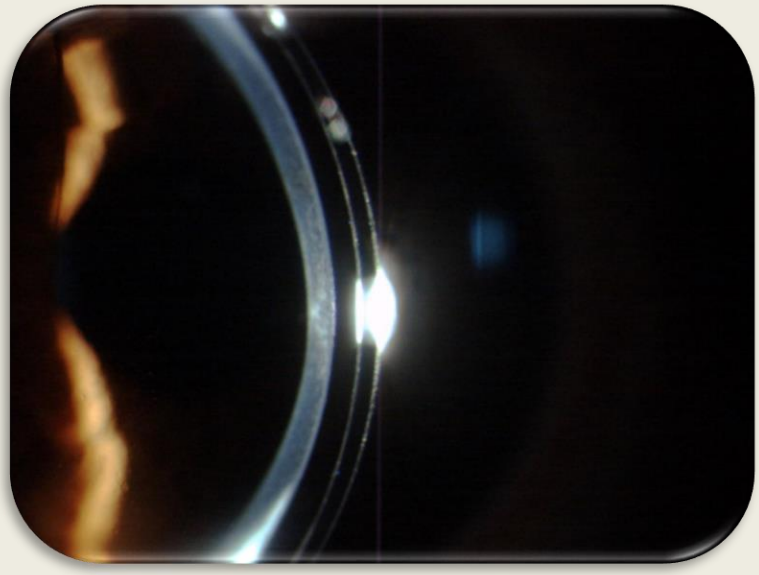

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