

Instituto de Ciência e Engenharia de Materiais e Superfícies (Lisboa) - ICEMS [84]

[ Página principal > **Relatório científico 2006** ]

Lacrado em 14-03-2007 19:38:00

**Indicadores de execução relativos a 2006 - Projecto Global**

<b>Indicadores de execução 2006</b>	<b>Previsto</b>	<b>Realizado</b>
<b>A - Publicações</b>		
Livros	4	9
Artigos em revistas Internacionais	127	141
Artigos em revistas nacionais	1	4
<b>B - Comunicações</b>		
Em congressos científicos Internacionais	124	135
Em congressos científicos nacionais	27	37
<b>C - Relatórios</b>	10	19
<b>D - Organização de seminários e conferências</b>	3	8
<b>E - Formação Avançada</b>		
Teses de Doutoramento	0	2
Teses de Mestrado	0	4
Outra	0	3
<b>F - Modelos</b>	1	3
<b>G - Aplicações computacionais</b>	0	1
<b>H - Instalações Piloto</b>	0	1
<b>I - Protótipos laboratoriais</b>	0	0
<b>J - Patentes</b>	0	14

**Relatório científico por sub-projecto**

<b>Sub-projecto</b>	<b>Investigador responsável</b>
<b>Sub-project leader</b>	
MATECHEMPRO	Maria Norberta Neves Correia Pinho
SMat	Luis Manuel Guerra Silva Rosa
PRECHAMAT	Rui Mario Correia Silva Vilar
<b>Total: 3</b>	

Data: terça-feira, 22 de Maio de 2007

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**(assinatura do Responsável pelo Projecto)**

22-05-2007 - 14:30



UNIÃO EUROPEIA - Fundos Estruturais



Governo da República Portuguesa

  
Ciência, Inovação  
2010

Programa Operacional Ciência e Inovação 2010

MINISTÉRIO DA CIÊNCIA, INOVAÇÃO E ENSINO SUPERIOR

Instituto de Ciência e Engenharia de Materiais e Superfícies (Lisboa) - ICEMS [84]

[ [Página principal](#) > [Relatório científico 2006](#) ]**Sub-projecto****Sub-project**

Structural Materials: processing, analysis and modelling

**Investigador responsável****Project leader**

Luís Manuel Guerra Silva Rosa

**Resumo da actividade desenvolvida**

Synopsis of the research work developed during 2006:

## 1. Cellular materials

The activities were focussed on:

- liquid foams: problems related to the energy of 2D foam clusters; instabilities in 2D and 3D bubble clusters; shapes of liquid films; effect of Plateau borders (triple film junctions) on the equilibrium and rheology of 2D and 3D foams;
- cellular materials (ceramic foams; cork quality).

## 2. Multiphase polymeric systems and biopolymers

Studies on dental materials, particularly adhesives, have progressed at the Nuclear Magnetic Resonance Laboratory. As part of a collaboration with the Univ of Granada (Spain), 3 commercially available adhesives were evaluated using Stray-Field MRI and spectroscopic NMR techniques in order to obtain the concentration of major compounds (in the liquids) and the influence of solvent evaporation and intensity of light on the concentration of less reactive monomers (in the cured adhesives), polymerization shrinkage and degree of double bond conversion. The monomer 2,2-bis(4-(2-methacryloxyprop-1-oxy)phenyl) propane was synthesized in order to prepare a new adhesive with improved properties and the work proposal "Synthesis, formulation and durability studies of a novel two component dental adhesive" has started, which involves the collaboration of Kuraray Co. (Japan). A detailed investigation of the influence of the composition of the photoinitiator system has started, aiming to perform photopolymerization reactions in the absence of the oxygen inhibitor effect. The influence of N,N-dimethyl-p-toluidine (DET) as an accelerator of the photopolymerization of several comonomers (e.g. hydroxy ethyl methacrylate/10-methacryloyloxydecyl dihydrogen phosphate) in the presence of camforoquinone (CQ), was studied using NMR techniques. EPR was used to follow the kinetics of radical formation in the monomeric system 2,2-bis-4-(2-hydroxy-3-methacryloyloxypropoxy) phenyl propane) /triethylene glycol dimethacrylate with the photoinitiator system CQ/DET. Additionally, stress-induced phase transitions in isotropic and oriented polyamide 12 were studied by <sup>13</sup>C Solid State NMR and complemented with Synchrotron WAXS observations.

The Laboratory of Rheology was involved in: - viscoelastic behaviour of cork in bending and compression, from -100°C to 300°C; - assessment of weathering degradation of fibre/polyester composites by dynamic mechanical thermal analysis; - rheological and microscopic characterization of bitumen modified with reactive polymers; - kinetics of polymer crystallization in shear as followed by DSC (shear-DSC) and by rheological means (coop. with Univ Minho and Aveiro).

## 3. Ceramic materials and composites

- Rock fracture mechanics and stone cutting technologies: development of advanced techniques for characterization of ornamental stones and cutting tools; propagation of cracks in stone blocks.
- Application of X-ray diffraction and petrography techniques to determine the mineralogical composition of granite and comparable hard rocks.
- Research to support the development of standards for characterization methods for ceramic (SiC, Al<sub>2</sub>O<sub>3</sub>) and carbon fibres used to reinforce ceramic matrix and carbon-carbon composites. Validation of mechanical test procedures and assessment of factors that affect the measurements. Development of statistical models for the distribution of strength data.
- Processing and characterisation studies of dense cordierite and cordierite foams, in collaboration with INETI.
- Studies on carbide synthesis of d-group transition metals and kinetic aspects of reaction under the solar spectral radiation, in collaboration with INETI and PROMES-CNRS, Odeillo, France.

## 4. Fatigue of materials and composite materials

- Metallic materials: cyclic plasticity and fatigue behaviour under dynamic multiaxial loading; determination of the crack paths; simulation of the elasto-plastic behaviour using finite element technique; fatigue crack growth under variable amplitude loading connected with the interaction effects between baseline cycles, underloads and overloads.
- Mixed mode fracture of laminated composite materials: new testing apparatus were designed and basic tests concerning single mode or mixed mode fracture were carried out.
- Product development: The research in this area is now beginning to emerge at ICEMS. Several publications were presented internationally and one MSc Thesis was also completed. This area will further evolve in the coming years. Three more MSc theses were completed in January 2007 and another 2 are envisioned. The Engineering Design & Advanced Manufacturing program involving several Portuguese universities and the Massachusetts Institute of Technology will bring more research funds and MSc/PhD theses.
- Mechanical behaviour of sandwich materials: Sandwich structures are present in many of the current composite constructions. Typical materials used for the core include polymer foams and aluminium or aramid paper honeycomb structures. For environmental reasons, it would be useful to consider, for the sandwich core, a natural material, as long as it retains a structural strength and stiffness comparable with the classical materials. Natural cork is an abundant material in Portugal, and the cork agglomerate industry is a well established one.

## 5. Fatigue and fracture of engineering materials and structures

Four research projects were in progress; one financed by RTO/NATO and the other three financed by FCT and Portuguese Institutions:

- "Surface integrity for fatigue life extension" (RTO/NATO, Project 131)
- "Fatigue design of exhaust conducts of naval gas turbines" (Portuguese Navy)
- Fatigue and creep behaviour of powder metallurgy nickel base superalloys, (FCT, POCTI/EME/46195/02)
- Reliability and fatigue design of railway components.

**Indicadores de execução 2006**

A - Publicações

Livros

Artigos em revistas internacionais

Artigos em revistas nacionais

B - Comunicações

**Previsto****Realizado**

2

4

22

27

1

2

Instituto de Ciência e Engenharia de Materiais e Superfícies (Lisboa) - ICEMS [84]

[\[ Página principal > Relatório científico 2006 \]](#)**Sub-projecto****Sub-project**

FUNCTIONAL MATERIALS IN ADVANCED CHEMICAL PROCESSES

**Investigador responsável****Project leader**

Maria Norberta Neves Correia Pinho

**Resumo da actividade desenvolvida**

Synthesis and characterization of functional materials – catalysts, membranes & electrodes – and their applications in advanced chemical, electrochemical & medical processes have been carried out according to planning, in three main directions:

**Catalytic Reaction Processes****1 - Catalytic Functionalization of Light Alkanes**

Investigation on i-butane oxidative dehydrogenation over nanostructured silica - supported NiMoO<sub>4</sub> catalysts with low content of active phase, involving:

A - Preparation of catalysts over silica supports. Extended characterization of the catalysts. Catalytic behaviour for oxidative dehydrogenation of i-butane.

**2 - Selective Oxidation of Olefins over Mixed Oxides**

Study of the catalytic activity of pure phases of bismuth molybdate catalysts and mixed phases for conversion of olefins with:

Comparison of the reduction rates by hydrogen and olefins with catalytic activity. Selective oxidation, isomerization and deep oxidation activities. Computation of the rate constants of the elementary catalytic steps.

**3 - Polymerisation and Technology of Polymerisation of Olefins**

Homo and copolymerisation of vinyl based monomers by transition metal catalysts. Development of novel activators.

“Site specific” functionalisation of ethylene/diene copolymers. Characterization and evaluation of the modified copolymers.

Production of polyolefins with unusual morphological properties:

Synthesis, characterization and test of supported zirconocenes. Materials obtainable from polyethylene nanofibers to polyethylene based nanocomposites.

**4 - Catalytic Reactions of Alcohols**

Study the effects of the iron precursors on the properties and catalytic behaviour of silica supported molybdenum-iron mixed oxide catalysts for methanol to formaldehyde oxidation.

Preparation of heterogeneous catalysts: 1) for biodiesel production by methanolysis of vegetal oils; 2) for steam reforming of bioethanol for hydrogen production.

**B - Membrane and Membrane Separations and Processes (MSP)****1. Preparation, functionalization and characterization of polymeric membranes**

Membranes with two soft segments (PU (polypropylene)/PBDO (polybutadiene); PU/PDMS (polydimethylsiloxane); PU/inulin; PU/PCL (polycaprolactone) were synthesised and extensively characterised through ATR-FTIR, Positron Annihilation Spectroscopy (PALS), SEM, TEM and XPS.

The characterization of the hemocompatibility ( hemolysis & thrombosis) and the gas permeation properties (correlated to hard/soft/soft segment phase separation) is envisaged for the use of these membranes (patent pending) in extracorporeal blood oxygenators ((Int.J.Art.Organs(2006)) .

Commercial membranes are characterized by zeta potential and surface charge. The mechanisms of selective transport are investigated for cellulose acetate membranes prepared with control of pore size.

**2. Modelling of Flow and Mass Transfer at Membrane/Fluid Interfaces and in Membrane Microfluidic Systems**

Modelling of mass transfer in Ultrafiltration (UF)/Nanofiltration (NF)/Reverse Osmosis (RO) membranes is performed using Computer Fluid Dynamics (CFD) and incorporating membrane/protein interactions and membrane wall permeation (Ch.Eng.Sci.(2006)).

**3. Development of Membrane Hybrid Processes**

Integration of UF/NF for production of drinking water free of health hazards and Cheese Whey Recovery. In wine industry is given special attention to: NF/Electrodialysis (ED) for must concentration (patent pending) , ED for tartaric stabilization and NF for Production of wines with low alcohol content ( national and international patents).

The project of an industrial plant for the isolation of clavulanic acid from the fermentation broths was based on the research results of fouling in UF/NF.

Since September the group belongs to a European Net of Excellence - “Expanding membrane macroscale applications by exploring nanoscale material properties” – Contract n° 500623-2.

During the period of 2006 most of the activities developed in 2005, continued their development and/or were finalised. The studies on the chemical analysis of boron compounds were successfully pursued and led to a MSc. Thesis approval in July, the degree being conferred to Diogo Santos. Preparation and characterisation of hydrogen storage alloys (HAS) was continued, with an emphasis on the use of nanotechnology techniques to increase the efficiency of hydrogen storage and its reversibility. Apart from punctual research activities in the domains of electrochemistry, energy and environment, there was a major movement towards hydrogen storage in novel functional and nanostructured materials, and hydrogen production by advanced alkaline electrolyzers, and by innovative means, namely by methanol reduction. Studies on polymer electrolytes for solid state batteries, and PEEK and S-PEEK membranes were carried on by M. João Plancha in the context of the project "Direct Methanol Fuel Cells, Modelling and Experimental Studies", in course in the Materials Electrochemistry (ME) Laboratory of the MTP Department at INETI (Lisbon).

Studies of hydrogen absorption, molecular beam deposition and time-of-flight mass spectrometry, fluorescence of nanostructured fullerene films, and scanning near-field optical microscopy were continued by Rui Lobo and his collaborators in his Laboratory of Nanotechnology and Science at the Nanoscale (GNCN) at FCT/UNL (Caparica).

At this point, it seems appropriate to inform that Lobo's article in Applied Physics Letters has been selected for the November 27, 2006 issue of Virtual Journal of Nanoscale Science & Technology, which is published by the American Institute of Physics and the American Physical Society, and covers a focused area of frontier research.

#### Indicadores de execução 2006

	Previsto	Realizado
<b>A - Publicações</b>		
Livros	1	3
Artigos em revistas internacionais	35	40
Artigos em revistas nacionais	0	1
<b>B - Comunicações</b>		
Em congressos científicos internacionais	19	23
Em congressos científicos nacionais	2	6
<b>C - Relatórios</b>	1	3
<b>D - Organização de seminários e conferências</b>	0	1
<b>E - Formação Avançada</b>		
Teses de Doutoramento	0	0
Teses de Mestrado	0	1
Outra	0	1
<b>F - Modelos</b>	0	0
<b>G - Aplicações computacionais</b>	0	0
<b>H - Instalações Piloto</b>	0	0
<b>I - Protótipos laboratoriais</b>	0	0
<b>J - Patentes</b>	0	4

#### Publicações em 2006

##### A – Papers in international journals

Afonso, M.D., "Surface charge on loose nanofiltration membranes", *Desalination*, 191 262-272, 2006.

Cavaco Morão, A.I., Brites Alves, A.M., Afonso, M.D., "Concentration of clavulanic acid broths: Influence of the membrane surface charge density on NF operation", *Journal of Membrane Science*, 281 (1-2), 417-428, 2006.

Cavaco Morão, A.I., Brites Alves, A.M., Costa, M.C., Cardoso, J.P., "Nanofiltration of a clarified fermentation broth", *Chemical Engineering Science*, 61 (8), 2418-2427, 2006.

Cavaco Morão, A.I., Brites Alves, A.M., Costa, M.C., Cardoso, J.P., "Optimization of operation mode for the concentration by NF of clarified fermentation broths", *Desalination*, 200, (1-3), 472- 474, 2006.

Brites Alves, A.M., Silva, N., "Recovery of water and sulfides from liming wastewaters", *Desalination*, (200), (1-3), 748-749, 2006.

Geraldes, V., Afonso, M.D., "Generalized mass-transfer correction factor for nanofiltration and reverse osmosis", *AIChE Journal*, 52, (10), 3353-3362, 2006.

Geraldes, V., de Pinho, M.N., "Mass transfer coefficient determination method for high-recovery pressure-driven membrane modules", *Desalination*, 195, 69-77, 2006.

Santos, J.L.C., Geraldes, V., Velizarov, S., Crespo, J.G., "Modelling of flow and concentration patterns in spiral wound membrane modules with ladder-type spacers", *Desalination*, 200, (1-3), 395-396, 2006.

Costa, A.R., de Pinho, M.N., "Performance and cost estimation of nanofiltration for surface water treatment in drinking water production", *Desalination*, 196, 55-65, 2006.

Costa, A.R., de Pinho, M.N., "Comparison of the performance of ultrafiltration and nanofiltration in surface water treatment", *Desalination* 199, 1-3, 73-75, 2006.

Costa, A.R., Elimelech, M., "Mechanisms of colloidal fouling in ultrafiltration of colloidal NOM solutions", *Journal of Membrane Science*, 281, (1-2), 716-725, 2006.

Minhalma, M., Domínguez, J.R., de Pinho, M.N., "Cork processing wastewaters treatment by an ozonization/ultrafiltration integrated process", *Desalination*, 191, 148-152, 2006.

Minhalma, M., Beal, L.L., Catarino, I., Mateus, M., de Pinho, M.N., "Optimization of saccharide fractionation using nanofiltration/ultrafiltration", *Desalination*, 199, 337-339, 2006.

Magueijo, V., Semião, V., de Pinho, M.N., "Effect of membrane pore size and membrane-solute interactions on lysozyme ultrafiltration", *Materials Science Forum: Adv Materials Forum III*, 514-516, 1483-1488, 2006.

Magueijo, V., Semião, V., de Pinho, M.N., "Cross diffusion effects in lysozyme/sodium chloride/water ultrafiltration", *Desalination*, 199, 445-447, 2006.

Magueijo, V., Semião, V., de Pinho, M.N., "Effects of ultrafiltration permeation rates on the hydrodynamics of a minichannel/slit laminar flow", *Chemical Engineering Science*, 61, 7139-7150, 2006.

Magueijo, V., Semião, V., de Pinho, M.N., "Integrated modelling of lysozyme ultrafiltration", *Journal of Membrane Science*, 286, 133-143,

2006.

Pinto, I., Queiroz, D. P., Gil M. H., Guiomar, J. A., de Pinho, M. N., "Polyurethane - Polyurea Membranes for Blood Oxygenation", Materials Science Forum: Advanced Materials Forum III, 514-516, 803, 2006.

Queiroz, D. P., Botelho do Rego, A. M., de Pinho, M. N., "Bi-soft segment polyurethane membranes: Surface studies by X-ray photoelectron spectroscopy", Journal of Membrane Science, 281, 239-244, 2006.

Queiroz, D. P., Pinto, I. M., Besteiro, M. C. F., Silva, A. F. M., Gil, M. H., Guiomar, A. J. M., de Pinho N., "Surface and hemocompatibility studies of bi-soft segment polyurethane membranes", International Journal of Artificial Organs, 29, 591-595, 2006.

Sarbu, A., de Pinho, M.N., Freixo, M.D., Goncalves, F., Udrea, I., "New method for the covalent immobilization of a xylanase by radical grafting of acrylamide on cellulose acetate membranes", Enzyme and Microbial Technology, 39, (1) 125-130, 2006.

Gonçalves, F., de Pinho, M. N., " Optimization of wine clarification by microfiltration / ultrafiltration", Chemical Technology, 16 – 18, 2006.

Zavoianu, R., Dias, C. R., Soares, A. P. V., Portela, M. F., "Oxidative dehydrogenation of i-butane over nanostructured silica – supported NiMoO<sub>4</sub> catalysts with low content of active phase", Appl. Catal A: Gen., 298, 40-49, 2006.

Arranz-Andrés, J., Benavente, R., Ribeiro, M. R., Pérez, E., Cerrada, M. L., "Evolution of a metallocenic sPP with time: Changes in crystalline content and enthalpic relaxation", Macromol. Chem. Phys., 207, 1564-1574, 2006.

Lobo, R. F. M. , Costa, Miguel , Ribeiro, Jorge, Sequeira, C. A. C. , Pereira, Pedro, "Fluorescence in Nanostructured Fulleride Films", Applied Physics Letters, Vol. 89, 203102-203104, 2006.

Lobo, R. F. M., Vicente, B. M. N., Gouveia, I. M. V., Berardo, F.M.V., Ribeiro, J.H.F., Pereira, P., "Detection of Negative Fullerene Conformers", Journal of Experimental Nanoscience, Vol. 1, 317-332, 2006.

Lobo, R. F. M. , Sequeira C. A. C., "Nanostructuring Beam-Deposited Fullerene Layers", Nanotechnology, Vol. 17, 4493-4496, 2006.

Lobo, R. F. M. , Silva, N.T., Vicente, B. M. N. , Gouveia, I. M. V. , Berardo, F.M.V., Ribeiro, J.H.F., "Fragmentation and Internal Steric Rearrangement of C<sub>60</sub> - in Electron Transfer Dynamics", European Physical Journal D, Vol. 38, 35-45, 2006.

Sequeira, C. A. C., Lobo, R. F. M., Anastassakis, G., "Electrochemical Reduction of AQ27DS in Aqueous Solution", Materials Science Forum, Vol. 514-516, 1338-1342 2006.

Sequeira, C. A. C., Santos, D. M. F., Brito, P. S. D., "Mediated and Non-Mediated Electrochemical Oxidation of Isopropanol", Applied Surface Science, Vol. 252, 17, 6093-6096, 2006.

Sequeira, C. A. C., Chen, Y., Santos, D. M. F., "Effects of Temperature on the Performance of the MmNi<sub>3.6</sub>Co<sub>0.7</sub>Mn<sub>0.4</sub>Al<sub>0.3</sub> Metal Hydride Electrode in Alkaline Solution", Journal of The Electrochemical Society, Vol. 153, 10, A1863-A1867, 2006.

Sequeira, C. A. C., Santos, D. M. F., "Theoretical Considerations of Solid State Diffusion of Impurities into Crystals", Czechoslovak Journal of Physics, Vol. 56, June, 549-564, 2006.

Sequeira, C. A. C., Santos, D. M. F., Baptista, W., "Oxygen Reduction at a Manganate Electrocatalyst in KOH Solutions", Journal of the Brazilian Chemical Society, Vol. 17, 5, 910-914, 2006.

Santos, D. M. F., Sequeira, C. A. C., "Electrocatalytic Studies of Oxygen Reduction at Lanthanum Barium Manganate", Defect and Diffusion Forum, Vol. 258-260, 327-332, 2006.

Chen, Y., Santos, D. M. F., Sequeira, C. A. C., "Hydrogen Diffusion in Austenitic Stainless Steels", Defect and Diffusion Forum, Vol. 258-260, 322-326, 2006.

Santos, D. M. F., Sequeira, C. A. C., "Chronopotentiometric Study of the Electrooxidation of Borohydride Anion in Alkaline Medium", Defect and Diffusion Forum, Vol. 258-260, 333-339, 2006.

Chen, Y., Sequeira, C. A. C., Song, X., Chen, C., "Effect of amorphous transformation on the electrochemical capacity of Rare-earth Mg-based Alloys", Z. Phys. Chem., Vol. 220, 631-639, 2006.

Chen, Yun, Wang, Xinhua, Chen, Lixin, Chen, Changpin, Wang, Qidong, Sequeira, C. A.C., "Electrochemical properties of rare-earth based hydrogen storage alloy for replacing Pt as the anode electrocatalyst in AFC", Journal of Alloys and Compounds, Vol. 421, 223-227, 2006.

Chen, Yun, Sequeira, C. A.C., "Electrocatalytic Properties of La<sub>2</sub>Mg<sub>17</sub> Based Metal Hydride Electrodes", Materials Science Forum, Vols. 514-516, 452-455, 2006.

Sequeira, C. A. C., Marquis, F.D.S., "Effect of Aluminising on the Hot Corrosion Resistance of Nickel-Chromium Alloys", Materials Science Forum, Vols. 514-516, 505-509, 2006.

#### B - Papers in national journals

Chen, Y., Sequeira, C. A. C., Song, X., "Ingress of hydrogen in Hastelloy X", Corr. Prot. Materiais, Vol. 25, 1, 12-15, 2006.

#### C – Books and chapters of books

Khabashesku, V. N., Barrera, E. V., Lobo, R. F. M., "Confined Tubular Carbon Nanostructures for Nanoreactors and Synthons", Focus on Nanotube Research, Ed. Dirote, Nova Science Publishers, p.1, 2006.

Sequeira, C. A. C. , Annualia, Editorial Verbo, Lisboa, 2005/2006, pp. 155-177. "Fuel Cells and their Application to Electric Vehicles"

Sequeira, C. A. C. , Annualia, Editorial Verbo, Lisboa, 2006/2007, pp. 141-154. "Nanoscience and Nanotechnology"

#### Communications

#### A – In international meetings



Geraldes, V., Semião, V., De Pinho, M. N., "CFD simulation of unsteady flow and vortex shedding in spiral-wound module feed-channels with ladder-type spacers", Mempro 3 - Integration des membranes dans les procédés, Nancy, France, April 5-7, 2006.

Geraldes, V., Anil, A., De Pinho, M. N., Eloy, M., Duarte, E., "Dissolved air flotation of Tagus river surface water as pre-treatment for nanofiltration", International Water Conference - IWC2006, Porto, Portugal, June 12 – 14, 2006.

Santos, J.L.C., Geraldes, V., Velizarov, S., Crespo, J. G., "Modelling of flow and concentration patterns in spiral wound membrane modules with ladder-type spacers", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Cavaco Morão, A. I., Brites Alves, A. M., Costa, M.C., Cardoso, J. P., "Optimization of operation mode for the concentration by NF of clarified fermentation broths", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Brites Alves, A. M., Silva, N., "Recovery of water and sulfides from liming wastewaters", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Costa, A. R., de Pinho, M. N., "Effect of pore size and operating pressure on membrane fouling and cleaning in surface water filtration", Mempro 3 - Integration des membranes dans les procédés, Nancy, France, April 5-7, 2006.

Costa, A. R., de Pinho, M. N., "Comparison of the performance of ultrafiltration and nanofiltration for surface water treatment and cost estimation of the drinking water", International Water Conference - IWC2006, Porto, Portugal, June 12 - 14, 2006.

Costa, A. R., de Pinho, M. N., "Comparison of the performance of ultrafiltration and nanofiltration in surface water treatment", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Costa, A. R., de Pinho, M. N., "Surface water purification by ultrafiltration and nanofiltration for drinking water production", CST Workshop - "Industrial water treatment and product purification", Lappeenranta, Finland, June 11-14, 2006.

Minhalma, M., Macedo, A., de Pinho, M. N., "Reduction of wastewaters and valorisation of by-products from "Serpa" cheese manufacture using ultrafiltration and nanofiltration", CST Workshop - "Industrial water treatment and product purification", Lappeenranta, Finland, June 11-14, 2006.

Minhalma, M., de Pinho, M. N., "Ultrafiltration and physical-chemical/ultrafiltration treatments for the cork processing wastewaters", International Water Conference - IWC2006, Porto, Portugal, June 12 - 14, 2006.

Minhalma, M., Beal, L. L., Catarino, I., Mateus, M., De Pinho, M. N., "Optimization of saccharide fractionation using nanofiltration /ultrafiltration", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Magueijo, V., Semião, V., de Pinho, M. N., "Cross diffusion effects in lysozyme / sodium chloride / water ultrafiltration", Euromembrane 2006, Giardini Naxos, Sicily, Italy, September 24-28, 2006.

Campos, J.M., Fernandes, A., Lourenço, J.P., Ribeiro, M.R., "Synthesis Of Polyethylene With Various Morphologies Using Cp2ZrCl2 Supported On Pure and Al-containing MCM-41", European Materials Research Society Fall Meeting 2006, Warsaw, September, 2006.

Tudella, J., Ribeiro, M. R., Deffieux, A., Cramail, H., Silva, L. C., Gomes, P. T., "Novel Organic Activators for single site iron catalysts", IUPAC International Symposium on Advanced Polymers for Emergent Technologies - PSK30, Korea, October, 2006.

Sequeira, C. A. C., Santos, D. M. F., "Oxygen Reduction at Lanthanum Manganates in Alkaline Medium", Meeting Abstracts, 209th Meeting of The Electrochemical Society, Denver, Colorado, USA, Abstract #274, May 7-12, 2006.

Sequeira, C.A.C. Chen, Y., "Studies of the Hydrogen Storage Alloy  $M(\text{NiCoMnAl})_{5.1}$  as Anode Electrocatalyst for PEMFCs", Meeting Abstracts, 209th Meeting of The Electrochemical Society, Denver, Colorado, USA, Abstract #275, May 7-12, 2006.

Franco, M. W., Sequeira, C.A.C., Condeço, J., "A Borohydride-H<sub>2</sub>O<sub>2</sub> Laboratory Fuel Cell", Meeting Abstracts, 209th Meeting of The Electrochemical Society, Denver, Colorado, USA, Abstract #276, May 7-12, 2006.

Sequeira, C.A.C., Gonçalves, M., Condeço, J., Pardal, T. C., Roncero, D. M., Aguado, B., "Electrochemical and Photocatalytic Reduction of Carbon Dioxide for Fuel Cell Utilization", Meeting Abstracts, 210th Meeting of The Electrochemical Society, Cancun, Mexico, Abstract #1795, October 29- November 3, 2006.

Sequeira, C.A.C., Pardal, T. C., Santos, D. M., Alves, J., Condeço, J., Franco, M. W., Gonçalves, M. C., Gama, S., "Studies on Sodium Borohydride for Energy Systems", Meeting Abstracts, 210th Meeting of The Electrochemical Society, Cancun, Mexico, Abstract #1807, October 29- November 3, 2006.

Franco, M. W., Sequeira, C. A. C., "An Improved Borohydride-H<sub>2</sub>O<sub>2</sub> Laboratory Fuel Cell", Meeting Abstracts, 210th Meeting of The Electrochemical Society, Cancun, Mexico, Abstract #1837, October 29- November 3, 2006.

Santos, D. M. F., Sequeira, C. A. C., "Anodic Reactions of Borohydride in Sodium Hydroxide Solutions", Meeting Abstracts, 210th Meeting of The Electrochemical Society, Cancun, Mexico, Abstract #1849, October 29- November 3, 2006.

Pardal, T., Gonçalves, M., Lang, M., "Electrochemical Mars in-situ propellant synthesis", Proceedings of the Third International Conference on Green Propellants for Space Propulsion, Poitiers, France, September, 2006.

## B – In national meetings

Duarte, E., De Pinho, M. N., Minhalma, M., "O desafio de tecnologias emergentes numa perspectiva ambiental integrada", Simpósio "A investigação na Universidade Técnica de Lisboa", Lisboa, Portugal, February 2-3, 2006.

Geraldes, V., Anil, A., De Pinho, M. N., Fonseca, C., Duarte, E., "Nanofiltração de água do Rio Tejo com pré-tratamento de flotação por ar dissolvido e filtração: Análise da remoção de carbono orgânico total e de compostos halogenados adsorvíveis", 12º Encontro Nacional de Saneamento Básico, Cascais, Portugal, October 24-28, 2006.

Vicente, Ana I., Campos, João, Moura Bordado, João, Ribeiro, Maria do Rosário, "Maleic Anhydride Modified Ethylene-Diene Copolymers: synthesis and properties", XX Encontro Nacional da Sociedade Portuguesa de Química, Costa da Caparica, December, 2006.

Dias, M., Carvalho, P. A., Dias, A. P., Sologub, O., Tougait, O., Noel, H., Gonçalves, A. P., "The Fe rich region of the U-Fe-B system: crystallization and microstructure", 12th Workshop on Magnetism and Intermetallics, Lisboa, Portugal, February, 2006.

Sequeira, C. A. C., "Intermediates in Ring-Disc Electrode Processes", 2nd International Conference on Diffusion in Solids and Liquids – DSL

2006, University of Aveiro, Portugal, July 26-28, 2006.

Plancha, M.J.C., "Production of Hydrogen by Borohydrides", Seminar in the framework of the NESSHY Project, INETI, April, 2006.

#### Technical reports

Progress report POCTI/FCB/47661/2002 – Development of new polyurea/polyurethane-based membranes for blood oxygenators.

3rd Technical Report corresponding to the 3rd year of execution (15 of October 2004 – 15 of October 2005) of the project POCTI/ EQU/ 39447/ 2001. FCT funding.

Two reports with Technical notes for ESA with titles "Innovative Gas Storage in Satellites" and "Energon - Space Long Term R&D".

#### Meetings organization

##### A - Organization of national or international conferences

Seminar "Melhores Técnicas Disponíveis (MTD) no regime de Prevenção e Controlo Integrados da Poluição (PCIP)" e "Técnicas Emergentes e Candidatas a Melhores Técnicas Disponíveis (MTD) no regime da Prevenção e Controlo Integrados da Poluição (PCIP)", organized by Instituto do Ambiente (IA) and Instituto Superior Técnico (IST). 19 January 2007, Centro de Congressos IST, Lisboa, Portugal.

##### B - Member of conferences scientific committees

Maria Norberta de Pinho is member of the following Scientific Committees: Mempro 3 - Integration des membranes dans les procédés, April 5-7, 2006, Nancy, France.; Engineering Conferences International on Water Treatment and Reuse, February 11-16, Tomar, Portugal; VI CITEM, July 8 -11, 2007, Campina Grande, Brasil.

Rui Lobo - International Symposia on Molecular Beams, from 1995 onwards.

Rui Lobo - IUVSTA Nanometer Scale Division, from 1996 onwards.

Sequeira, C. A. C. - Second International Conference on Diffusion in Solids and Liquids

#### Advanced training

##### A – PhD Thesis

Ana Rita Gonçalves da Costa, "Mecanismos de Colmatação Coloidal em Ultrafiltração e Nanofiltração de Matéria Orgânica Natural de Águas de Superfície", Supervisor – Prof. de Pinho, M. N., Submitted in December 2006.

Vitor Magueijo, Dinâmica de Fluidos Computacional e Transferência de Massa em Ultrafiltração de Proteínas, Supervisor – Prof. De Pinho, M. N., Co-supervisor - Prof. Semião, V., Started in January 2002.

Ana Mourão, Estudo e Optimização de um Processo Integrado de Membranas para o Isolamento de um Inibidor das  $\beta$ -Lactamases, Supervisor – Prof. Ana Maria Alves. Started in 2004.

Antónia Teresa Zorro Nobre Macedo, Ultrafiltração e Nanofiltração de Soro de Queijo de Serpa, Instituto Superior de Agronomia (ISA), Supervisores – Prof. De Pinho, M. N. & Prof. Duarte, E. (ISA). Started in 2005.

Joana Luís Refoios Tudela, "Synthesis of modified polyolefins via copolymerisation with polar monomers", supervisor: Maria do Rosário Ribeiro, (On – going)

João Miguel Dórdio Campos, "Development of supported catalysts for the olefin polymerization", supervisor: Maria do Rosário Ribeiro, (On – going)

Luís Filipe Frechaut Tropa Torres Gonçalves, "Electrochemistry of Prussian Blue in aqueous systems", Supervisor: Sequeira, C. A. C., expected date of submission: April 2007

Rui Pedro da Costa Neto, "Polymer fuel cells for electric vehicles", Supervisor: Sequeira, C. A. C., expected date of submission: February 2007

Maria João Plancha Carrilho, "PEO-M Salts based electrolytes for primary cells", Supervisor: Sequeira, C. A. C., expected date of submission: May 2007

##### B - Master Thesis

Diogo Santos, "Analysis of Boron Compounds Present in the Electrosynthesis of Sodium Tetrahydridoborate", Supervisor: Sequeira, C. A. C., approved on July 2006.

##### C – Other

Supervision of research work of :

Ana Isabel Vicente, (grant holder, Project POCTI CTM /41408, Started: Abril 2004)

#### Patents

"Processo integrado de nanofiltração e electrodiálise para a concentração e rectificação de mosto de uva", de Pinho, M. N., Geraldés, V., Catarino, I. patent application N 103595, December 2006.

"Processo de Fabrico e Membranas Hemocompatíveis de Poliuretanas", de Pinho, M. N., patent application 103560, September, 2006.

"System of exploitation of atmospheric resources", Tiago Pardal, Marco Freire, May, 2006.

"Safe gas storage in small reservoirs", Tiago Pardal, António Relógio Ribeiro, Pedro Vilaça, September, 2006.

Others

Maria Norberta de Pinho was a member of the International Committee "Strategic Advisory Committee"(SAR) of VITO Laboratories ,Mol, Belgium.

Participation in COHITEC 2006 with presentation of a Business Plan "MEMBROX"

Approval of proposal "Neotec"(ADI) " Concentração e rectificação de mosto de uva"

Supervision of Industrial Training of Isabel Ferreira and Sofia Mendes at Fujifilm Imaging Colorants Ltd,Scotland

A – Membership of European Research Networks

Member of the European Network of Excellence NanoMemPro "Expanding membrane macroscale applications by exploring nanoscale material properties", Sixth Framework Programme, Priority 3 – Nano-technologies and nano-sciences, knowledge-based multifunctional materials, and new production processes and devices – "NMP", Contract no. 500623-2, since September 2004.

"Projecto de Reequipamento" – "Network of laboratories of functional materials for reactions, membrane processes and fuel cells", Coordinated by Prof. De Pinho, M. N.. Equipment for flow and mass transfer characterization (PIV, HI) and membrane surface characterization (EKA).

GRECAT is member of the EU – funded Coordination Action of Nanostructured Catalytic Oxide Research and Development in Europe (CONCORDE) approved and contracted in 2004.

B – Member of editorial advisory board of international journals

Dr. Maria Diná Afonso is a member of the International Advisory Board of the Jordan Journal of Mechanical and Industrial Engineering (JJMIE).

C – Reviewing of papers in international scientific journals

Dr. Maria Norberta de Pinho reviewed manuscripts submitted for publication in Journal of Membrane Science, Industrial & Engineering Chemistry Research, Desalination, Separation and Purification Technology, Separation Science and Technology, International Applied Polymer Science, International Journal of Artificial Organs, in 2006.

Dr. Ana Maria Brites Alves reviewed manuscripts submitted for publication in Desalination, Journal of Membrane Science and Separation and Purification Technology in 2006.

Dr. Maria Diná Afonso reviewed manuscripts submitted for publication in Desalination and Journal of Membrane Science in 2006.

Dr. Vítor Geraldês reviewed manuscripts submitted for publication in Journal of Membrane Science, AIChE Journal, Journal of Hazardous Materials, and Chemical Engineering & Processing in 2006.

Dr. Miguel Minhalma reviewed manuscripts submitted for publication in Desalination and Journal of Hazardous Materials in 2006.

Manuel Farinha Portela - Review of papers for international scientific and technical journals, such as "Applied Catalysis A" (Elsevier), "The Journal of Physical Chemistry" (American Chemical Society) and Chemical Papers (Springer)

Maria do Rosário Ribeiro - Review of papers for international scientific journals, on the polymerisation field, such as "Macromolecular Chemistry" (Wiley), "European Polymer Journal", "Catalysis Communications" (Elsevier) and Macromolecules (ACS).

During 2006 refereeing work for Materials Research Bulletin, Journal of Applied Electrochemistry, and other technical and scientific journals, has been pursued.

Cooperation with other Portuguese and International Institutions was maintained during the 2006 period, as done before (see Research Report for 2002). In particular, collaboration with the University of Madison-Wisconsin (USA) has been enhanced, particularly in the areas of composite hydrides, and hydrogen storage in nanomaterials.

**Data:** sexta-feira, 18 de Maio de 2007

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(assinatura do Responsável pelo Projecto)

18-05-2007 - 14:17



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Instituto de Ciência e Engenharia de Materiais e Superfícies (Lisboa) - ICEMS [84]

[ [Página principal](#) > [Relatório científico 2006](#) ]

## Sub-projecto

### Sub-project

Preparation and characterisation of multifunctional surfaces and thin films

### Investigador responsável

#### Project leader

Rui Mario Correia Silva Vilar

## Resumo da actividade desenvolvida

The research on surfaces and thin films covered three main areas: (i) functional thin films; (ii) surface modification; (iii) materials and interface design.

### (i) Functional thin films

The activities in this area concerned mainly the fabrication and characterisation of thin films for spin and opto electronics, nanophotonics and integrated optics.

In what concerns thin films for spin electronics, ferromagnetic Fe<sub>3</sub>O<sub>4</sub> and CrO<sub>2</sub> films were deposited by PLD (pulsed laser deposition) and CVD (chemical vapour deposition), respectively. These films were characterised by X-ray diffraction, conversion electron Mössbauer spectroscopy (CEMS) and AFM, and their magnetic and spin dependent transport properties were investigated as a function of temperature and magnetic field by extraction magnetometry, magnetoresistance and spin polarization measurements.

In the area of nanophotonics, one- and three-dimensional photonic crystals were prepared by sol-gel processing, including the fabrication of 1-D coupled microcavity multilayer structures doped with Er<sup>3+</sup> and Yb<sup>3+</sup> and the study of the energy transfer processes between these active ions. 3-D opal and inverse opal structures were also prepared from self-assembled polystyrene sphere templates infiltrated with titania. A research program in biomaterials for regenerative bone tissue engineering, devoted to the preparation of bioactive and resorbable glass scaffolds, with dual porosity at the nano and macro scales, was also launched in 2006.

Finally, the PLD technique was used to prepare GaN thin films. Results from photoluminescence decay and transient photocurrents were compared with respect to trapping, recombination, and transport of photo-generated carriers, in polycrystalline GaN thin films. In addition, the degradation of a-Si:H based p-i-n detectors, when subjected to a 1.5 MeV He<sup>4</sup> beam, was studied by means of photoconductivity measurements.

### (ii) Surface modification

The crystallographic structure of Rene N4 superalloy deposited on CMSX-4 single crystalline substrates was studied by XRD, SEM/EBSD and TEM aiming to uncover the conditions for preserving the single crystal structure in the deposited material. This work is carried out in collaboration with Rolls Royce and TWI.

Al- and Fe-based composites reinforced with NbC SiC and TiB<sub>2</sub> are being developed for rapid tooling applications were developed. A thermokinetic model was used to relate the laser processing parameters and the dilution kinetics of reinforcement particles in the melt with the final structure and properties. Along similar lines Cu-alumina, Cu-Fe<sub>3</sub>C and Cu-NbC nanostructured powders synthesized by mechanical alloyed are being used to produce high temperature seals by laser cladding.

Three projects are being carried in the biomedical field, aiming at: (a) using laser microtexturing to create surfaces with specific properties (adhesion, wettability, biointegration, drug release ability, etc.) in materials such as hydroxyapatite and bioglass; (b) to studying laser ablative removal of carious dentin; (c) applying laser deposition to the near-net shape manufacture of implants for craniomaxillofacial reconstruction.

The development of environmentally friendly technologies for corrosion protection of metals using nanostructured hybrid coatings prepared both by immersion and sol-gel processing has been investigated envisaging, in particular self-healing coatings. Attention has also been devoted to electropolymerization of Al alloys and to the corrosion behaviour of formed parts and cut edges of galvanised steel. Fundamental studies on the passivity of metals and alloys and on the semiconducting properties of the passive films, in conjunction with chemical properties have also been carried out. For all these studies the use of techniques such as SVET, Scanning Kelvin Probe, Electrochemical Impedance spectroscopy, SEM, TEM, AES/XPS were of paramount importance.

### (iii) Materials and Interface Design

Combinatorial materials design is being used to design alloys for biomedical applications based on the Ti-Zr-Nb-Mo-Ta systems and abrasion resistant metal-matrix composites. Within other projects the ferro/paramagnetic configuration of nanocrystalline FeCr alloys and the magnetic properties and defect substructure of RFe<sub>12</sub>-xMx compounds (R = rare earth, M = late 3d transition metal) are being studied by Mössbauer spectroscopy, TEM and Lorentz microscopy. AFM/nanoscratching are being used to study the influence of the stacking fault energy on the abrasive behaviour of Ni-Co alloys at the nanoscale.

The focus of research in interfaces is in systems where metal/ceramic or ceramic/ceramic interfaces play a key role: the study of new production routes for tougher ceramic and metal matrix composites and the relations between interface properties, production opportunities and properties are the aim of the research.

## Indicadores de execução 2006

	Previsto	Realizado
A - Publicações		
Livros	1	2
Artigos em revistas internacionais	70	74
Artigos em revistas nacionais	0	1
B - Comunicações		
Em congressos científicos internacionais	72	76
Em congressos científicos nacionais	16	20
C - Relatórios	5	10
D - Organização de seminários e conferências	1	3
E - Formação Avançada		
Teses de Doutoramento	0	2
Teses de Mestrado	0	2
Outra	0	1
F - Modelos	1	3
G - Aplicações computacionais	0	1
H - Instalações Piloto	0	1

## Publicações em 2006

### Publications

#### A – Papers in international journals

Almeida, A., Carvalho, F., Carvalho, P. A., Vilar, R., "Microstructure, Mechanical and Wear Behaviour of Al-Mo Surface Alloys", *Surface and Coatings Technology*, 200 4782-4790, 2006.

Livramento, V., Marques, M. T., Correia, J. B., Almeida, A., Vilar, R., "Preparation of dispersion-strengthened coppers with niobium carbide and niobium boride by mechanical alloying", *Materials Science Forum*, 514-516, pp 707-711, 2006.

Almeida, A., Carvalho, P. A., Vilar, R., "Laser Developed Al-Cr Surface Alloys: Microstructure, Mechanical and Wear Behaviour", *Materials Science Forum*, 514-516, pp. 490-494, 2006.

Costa, L., Vilar, R., Reti, T., "Laser powder deposition of tool steels: strategies leading to homogeneous parts", *Materials Science Forum*, 514-516, pp. 739-743, 2006.

Graça, S., Colaço, R., Vilar, R., "Using atomic force microscopy to retrieve nanomechanical surface properties of materials", *Materials Science Forum*, 514-516, pp. 1598-1602, 2006.

Eugénio, S., Sivakumar, M., Vilar, R., "Surface Treatment of Human Dentin by KrF Laser", *Materials Science Forum*, 514-516, pp. 1044-1048, 2006.

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Teixeira, S., Queiroz, A. C., Monteiro, F. J., Ferraz, M. P., Vilar, R., Eugenio, S., "Osteoblast proliferation and morphology analysis on laser modified hydroxyapatite surfaces: Preliminary results", *Bioceramics* 18, 105-108, 2006.

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Nogueira, I. D., Carvalho, P. A., Pereira, J. C., Vilar, R., "Complex and superlattice stacking faults in D019 Co3W", *Philosophical Magazine*, 86, 1763-1774, 2006.

Sivakumar, M., Oliveira, V., Oliveira, S., Leitão, J., Vilar, R., "Influence of tubule orientation on cone-shaped texture development in laser ablated dentin", *Lasers in Medical Science*, 21, 160-164, 2006.

Sivakumar, M., Oliveira, V., Vilar, R., Oliveira, S., Leitão, J., "Sealing of human dentinal tubules by KrF 248 nm laser radiation", *Journal of Laser Applications*, 18, 330-333, 2006.

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Serro, A. P., Gispert, M. P., Martins, M. C. L., Brogueira, P., Colaço, R., Saramago, B., "Adsorption of albumin on prosthetic materials: Implication for tribological behaviour", *Journal of Biomedical Materials Research*, 78A, 581, 2006.

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Dias, D., Carvalho, P. A., Ferro, A., Lohwasser, W., "TEM and XRD investigation of MnO2 microstructure and its influence on ESR of Ta capacitors", *Materials Science Forum*, 514-516, 269-273, 2006.

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Ayouchi, R., Bentes, L., Queiroz, P., Santos, C., Schwarz, R., Niehus, M., "ZnO Thin Films Grown by Chemical Spray Pyrolysis", poster presentation at 4th International Workshop on ZnO and Related Materials, Giessen, Germany, October 3-6, 2006.

Niehus, M. and Schwarz, R., "New results on diffusion lengths measurements in wide bandgap semiconductors, obtained from steady state photocarrier gratings (SSPG)", Talk at European Materials Research Society (E-MRS) Spring Meeting,, Nice, France, 29 May – 2 June, 2006.

Niehus, M., "Correlation between diffusion lengths and transient decays in polycrystalline wide bandgap semiconductors", Poster no 1<sup>o</sup> Workshop "Low-Dimensional Semiconductor Structures: Growth, Properties and Applications" na Universidade de Aveiro, Portugal, 27 - 28 January, 2006.

## B – In national meetings

Nero, P., Nogueira, I., Vilar, R., Bravo Pimentão, J., "Identificação de Cristais no Líquido Sinovial por Microscopia Electrónica", Acta Reumatica Portuguesa 3175-81, 2006.

Trindade, Ana Raquel Maia, Redinha, Luís, Arantes e Oliveira, Sofia, Almeida, Amélia, Leitão, Jorge, "Adesão entre cerâmicas feldspáticas convencionais e titânio puro", XXVI Annual Congress of the Portuguese Society for Stomatology and Dental Medicine, Lisbon, 20 and 21 October 2006 (poster).

Nunes, D., Carvalho, P. A., Colaço, R., Gonçalves, A. P., "Magnetic structures in NdFe<sub>11</sub>Mo and YFe<sub>11</sub>Mo", LXI Reunião da Sociedade Portuguesa de Microscopia, Resumos da Reunião Anual da SPMicros, Universidade do Minho, Braga (comunicação em painel) 14-15 de December 2006.

Nogueira, I., Nunes, D., Carvalho, P. A., Fernandes, H., Correia, J. B., Shohoji, N., "Erosão por plasma de extrudidos de cobre-nanodiamante", LXI Reunião da Sociedade Portuguesa de Microscopia, Resumos da Reunião Anual da SPMicros, Universidade do Minho, Braga (comunicação em painel) 14-15 December 2006.

Dias, M., Carvalho, P.A., Dias, A.P., Sologub, O., Tougait, O., Noel, H., Godart, C., Leroy, E., Gonçalves, A. P., "Liquid-solid equilibria in the Fe-rich corner of U-Fe-B system", XX Encontro Nacional da Sociedade Portuguesa de Química, Monte da Caparica, 14-16 December 2006 (Comunicação oral).

Skiba, E., Miranda, M.A., Carvalho, P. A., Pereira, E., "Controlled Photochemical Synthesis of Gold Nanoparticles", 4.º Encontro do

REQUIMTE, p. 99, Fátima (Comunicação em painel), 31 March - 1 April 2006.

Nunes D., Carvalho, P. A., De Hosson, J.Th.M, Gonçalves, A. P., "Magnetic domains in Y-Fe-Mo and Y-Fe-Ti alloys system", 12th Workshop on magnetism and Intermetallics, Instituto Tecnológico Nuclear, Sacavém (comunicação oral), 9 - 10 February 2006.

Dias, M., Carvalho, P. A., Dias, A.P., Sologub, O., Tougait, O., Noel, H., Gonçalves, A. P., "Recent investigations on the U-Fe-B ternary system", 12th Workshop on magnetism and Intermetallics, Instituto Tecnológico nuclear, Sacavém (comunicação oral), 9 - 10 February 2006.

Almeida, Rui M., "Cristais fotónicos: um exemplo de metamateriais por via sol-gel", A Investigação Científica na UTL, Lisboa, IST, February 2-3, 2006. (Invited lecture).

Almeida, Rui M., "Nanotecnologias optoelectrónicas: nanofotónica e nanoelectrónica", Nanotecnologias em Portugal: Ciência, Indústria e Sociedade, Simpósio da Academia de Engenharia, OE, Lisboa, November 28, 2006. (Invited lecture).

Simões, A.M., Montemor, M.F., Fernandes, J. C. S., "Localized Techniques for the Study of Corrosion Processes", KeyNote Lecture, Electroquímica e Inovação 2006, e-inov, Porto, Portugal, October 2006.

Cecílio, P., Montemor, M.F., Simões, A.M.P., "The role of electrogalvanised steel on the corrosion inhibition performance of cerium ions", Apresentação por Poster, Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Cabral, A.M., Serra, R., Zhuledkevich, M., Montemor, M.F., Ferreira, M. G. S.; "Corrosion performance of cerium doped silane pre-treatments on aluminium alloys", Apresentação por Poster, Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, (Poster vencedor do Prémio INOVAÇÃO), October 2006.

Simões, A., Montemor, M.F., Fernandes, J.S., "Localized Techniques for the Study of Corrosion Processes", KeyNote lecture, Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Relógio, S., Fernandes, J.C.S., Simões, A. M., "Study of Cut Edges on Galvanised Steel", apresentação por poster, Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Martins, N., Silva, T.M., Fernandes, J.C.S., "Electrodeposition of Polyaniline on Aluminium Alloy 6061-T6: Electrochemical Activity and Corrosion Protection Properties", Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Figueira, N., Silva, T.M., Carmezim, M.J., Fernandes, J.C.S., "Corrosion Behaviour of NiTi Alloy in Hank's Solution", Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Relógio, S., Fernandes, J.C.S., Simões, A.M.P., "Study of Cut Edges on Galvanized Steel", Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Torres, J.P.N., Fernandes, J.C.S., Castela, A.S., "Local Potential and Current Distribution on Metals", Jornadas de Electroquímica e Inovação 2006, Porto, Portugal, October 2006.

Niehus, M., Schwarz, R. , "Optoelectronic effects in bulk and artificial wide gap semiconducting structures ", Talk at Workshop on Coherent Nonlinear Optics of Artificial Media, University of Lisbon, 15 December, 2006.

#### Technical reports

Montemor, M. F., Alves, J.H., Simões, A., Lourenço, Z., Costa, A., Appleton, A., " Novos Avanços na Protecção Catódica para Reabilitação de Estruturas de Betão Armado"; Projecto N° Sifec 13.02.03 Feder 00054, Relatório Técnico nº 5, May 2006.

Grundmeier, G., Klüppel, I., Schinking, B., Lamaka, S., Zheludkevich, M., Ferreira, M., Montemor, M.F., Raab, A.E., Till, E., Serra, M.G., RFS RTD Program, "Formability and Self-Repair Properties of Advanced Weldable Primers (PrimeForm)" (Project n° RFS-CR-04031) Technical report n° 4, June 2006.

Fernandes, J.C.S., Silva, T.M., Montemor, M.F., FCT / POCI Project "Revestimentos por Polimerização para Pré-Tratamento de Ligas de Alumínio" (Proj. n° POCI/CTM/60064/2004), Technical Report No: 1 (1st year Report), January, 2006.

Fernandes, J.C.S., Silva, T.M., Carmezim, M.J., FCT / POCI Project "Tratamento Superficial da Liga NiTi para Optimização da Biocompatibilidade e Resistência á Corrosão em Aplicações Biomédicas" (Proj. n° POCI/CTM/62049/2004), Technical Report No: 1 (1st year Report), January, 2006.

Fernandes, J.C.S., Castela, A.S., FCT / POCI Project "Estudo da Distribuição das Correntes e Potenciais Locais na Superfície das Metais" (Proj. n° POCI/CTM/59960/2004), Technical Report No: 1 (1st year Report), January, 2006.

Fernandes, J.C.S., Ferreira, M.G.S., Fonseca, I.T.E., Lopes, I.S.L., Montemor, M.F., Picciochi, R., Pereira, A.M.R., Proença, L.F., FCT / POCTI Project "Avaliação Laboratorial e In-Situ da Durabilidade de Aluminios Anodizados por Tecnologias Limpas" (Proj. n° POCTI/CTM/39846/01), Technical Report No: 3 (3rd year Report), April, 2006.

Rohwerder, M., Turcu F., Allély, C., Ostwald, C., Altgassen, C., Conejero, O., Rivera, S., Tomandl, A., Fernandes, Simões, A.M.P., J.C.S., Choquet, P., Chassagne, J., Steel RTD Program "Self-Healing at Cut-Edge of Coil Coated Galvanized Steel Sheet" (project n° RFS-CR-04021) Technical Report No: 4 (Half-year Report), July, 2006.

Final RTD of POCTI/CTM/41413/2001 Project "Laser-driven synthesis of ferromagnetic oxides for spin electronics".

1st Year Progress Report of POCI/CTM/57019/2004 Project "Synthesis of room temperature diluted magnetic semiconductors by low temperature methods".

1st year Report of E-19/06 Portuguese-Spanish Bilateral Collaboration Project on "Development and characterization of Si/HfO2/SiGe/SiO2 nanostructures for application in nanomemories".

#### Meetings organization

A – Organization of national or international conferences

Vilar, R. was member of the Programme Committee and Session Chair ICALEO 2006 – 25th International Congress on Applications of Lasers and Electrophysics, Materials Processing Symposium, October 30-November 2, 2006, Scottsdale, Arizona, USA

Almeida, A. was organizer of the Surface Engineering session at ALAC 2006 – Advanced Laser Applications Conference and Exposition, 18-21 September 2006, Michigan, USA.

Fernandes, J.C.S., organization of “Jornadas de Electroquímica e Inovação 2006”, Porto, Portugal, 2006.

B – Member of conferences scientific committees

Rui M. Almeida, Member of Scientific Committee of 6th Symposium SiO<sub>2</sub>, Advanced Dielectrics and Related Devices, Palermo (Italy), June 25-28, 2006.

Rui M. Almeida, Member of Scientific Committee of 10th International Conference on the Structure of Non-Crystalline Materials, Prague (Czech Rep.), September 18-22, 2006.

Ferreira, Mário G.S., Member of the Scientific Committee of Electrochemical Methods in Corrosion Research (EMCR 2006), Dourdan, France, June 2006.

Ferreira, Mário G.S., Member of the Scientific and Technical Committee of Latincorr 2006, Fortaleza, Brasil, May 2006.

Olinda Conde was a member of the International Scientific Advisory Committee of the following international conferences:

European Materials Research Society Spring Meeting, Symposium H on “Photon-Assisted Synthesis and Processing of Functional Materials”, Nice, France, 29 May – 2 June, 2006;

Iberian Vacuum Meeting and Applications, RIVA’06, Salamanca, Spain, 26 – 28 June, 2006;

5th International Conference on “Photo-Excited Processes and Applications”, 5-ICPEPA, Charlottesville, Virginia, USA, 3 – 7 September, 2006;

International Conference on “Advanced Laser Technologies”, ALT’06, Brazov, Romania, 8 – 12 September, 2006

Advanced training

A – PhD Thesis

Manickam Sivakumar, “Laser Surface Processing for Odontological Applications”, Instituto Superior Técnico, supervisor Prof. Vilar, R. (to be concluded in 2007).

José Lino Vasconcelos da Costa, “Aplicação da deposição assistida por laser ao fabrico de protótipos”, Instituto Superior Técnico, supervisor Prof. Vilar, R. (to be concluded in 2007).

Maria Teresa Ribeiro Marques, “Estrutura - propriedades de nanocompósitos à base de cobre produzidos por mecanosíntese”, Instituto Superior Técnico, supervisor Dr. José Brito Correia (INETI) e Prof. Vilar, R. (to be concluded in 2007).

Christopher Gareth Meacock, “Laser-Assisted Design of Titanium Alloys for Dental Prosthesis”, Instituto Superior Técnico, supervisor Prof. Vilar, R. (to be concluded in 2007).

Anandkumar, R., “Rapid Tooling by Laser Powder Deposition of Aluminium Matrix Composites”, Instituto Superior Técnico, supervisor Prof. Vilar, R. and Prof. Amélia Almeida (to be concluded in 2008).

António Sérgio da Sousa Crespo, “Aplicação da deposição assistida por laser à manufactura de próteses e implantes metálicos”, Instituto Superior Técnico, supervisor Prof. Vilar, R. (to be concluded in 2008).

Sérgio de Almeida Graça, “Tribology of Ni-Co Alloys: from the Micro to the Macro Scale”, Instituto Superior Técnico, supervisor Prof. Rogério Colaço and Prof. Vilar, R., (to be concluded in 2008).

E. C. Santos, “Laser powder deposition of single crystal aerospace superalloys”, Instituto Superior Técnico, supervisor Prof. Vilar, R. (to be concluded in 2009).

Marina Lampreia, “Contribuição para o estudo do processamento de próteses dentárias por deposição assistida por laser”, Faculdade de Medicina Dentária, Universidade de Lisboa, supervisor Prof. Amélia Almeida and Prof. Gil Alcoforado FMDUL (to be concluded in 2010).

Marta Sofia Rosado Silva Dias, “Ternary intermetallic borides”, Instituto Superior Técnico, Supervisor Prof.<sup>a</sup> Patrícia Carvalho and Dr. António Gonçalves (ITN) (to be concluded in 2008).

Luis Miguel Amante Fortes, “New tellurium oxide based glasses doped with erbium”, supervised by M. Clara Gonçalves and co-supervised by Luís F. Santos (Ph.D. in Materials Engineering, at Instituto Superior Técnico, Technical University of Lisboa, December 2006).

Raquel Alexandra Galamba Duarte, “Influência de Parâmetros Climáticos nas Propriedades Anticorrosivas de Materiais Pré-pintados”, ongoing, Supervisor: Ferreira, M.G.S.

Paulo Alexandre Gonçalves Venâncio, “Sensores de Corrosão para aeronaves”, ongoing, Supervisor: Fernandes, J.C.S.

Ana Maria Mateus Cabral, Finished June 2006, “Estudo de Filmes de Bis-[trietoxisililpropil] tetrasulfano (BTESPT) para pré-tratamentos anti-corrosivos da liga de alumínio 2024-T3”, Supervisor: Ferreira, M.G.S.

Pedro M. Sousa, “Síntese de filmes finos de óxido de cromo por LCVD (Laser-assisted CVD) e caracterização” – FCUL; Supervisor: Olinda Conde, Co-Supervisor: António J. Silvestre (to be concluded by Sept. 2007)

Nicoleta Popovici, “Filmes finos de óxidos funcionais para aplicações em spintrónica. Crescimento e caracterização” – FCUL; Supervisor: Olinda Conde (to be concluded by Dec. 2007)

Ana Mafalda Guedes, “Novel Reaction Infiltration Process for Aluminium Alloy Matrix Composites”, Supervisor Ferro, A. C. (started September 2004)

Décio Dias, “Tantalum Capacitors with low ESR values”, Supervisor Ferro, A. C. (submitted 12/2006).

## B – Master Thesis

Kevyn Degiampietro, "Nanoabrasive Wear induced with an AFM diamond tip: a case study with AISI 316L stainless steel", Università Degli Studi di Padova – Facoltà di Ingegneria, Tese di Laurea (Conclusão: Outubro de 2006, Laurea cum laude). Relator: Prof. Massimo Guglielmi, Co-relator and scientific supervisor: Prof. Rogério Colaço.

Daniela da Silva Nunes, "Magnetic domains in Y-Fe-Mo, Y-Fe-Ti, Nd-Fe-Ti and Nd-Fe-Mo alloys", Instituto Superior Técnico, Supervisor: Prof.ª Patrícia Carvalho (to be concluded in 2007).

Ilda Leonor Lobato Narciso, Finished December 2006, Supervisor: A.M.P. Simões

Nádia Cristina Amaral Figueira, ongoing, Supervisor: Fernandes, J.C.S.

João Paulo Neto Torres, ongoing, Supervisor: Fernandes, J.C.S.

## C – Other

M. Clara Gonçalves was the senior thesis supervisor of undergraduate student Marta Veríssimo, at Saint-Gobain Glass Portugal (2006).

## Models

Three-dimensional finite element thermokinetic model of laser freeform manufacturing of Ti alloys.

Three-dimensional fluid dynamics model of the distribution of particles in forest fire smoke plumes simulating momentum, heat, and mass transfer and based on Navier-Stokes equations.

Mesoscopic UV laser ablation model for composite and biological materials such as ceramic reinforced polymers, dentin and bone.

## Computer Applications

### Computer Program:

GAMGI, General Atomistic Modelling Graphic Interface,

Most recent release: GAMGI 0.12.4

Website: <http://www.gamgi.org/>

GAMGI Website: <http://www.gamgi.org>

## Pilot Installations

Cathodic Protection system: Vasco da Gama Bridge (Pilar SV39D), Portugal, Result of the Project CATÓDICA (2003-2006).

## Patents

US patent application (provisional patent claim): "Preparation method of Nano/macroporous bone tissue scaffolds for regenerative medicine" (authors: Ana C. Marques, Rui M. Almeida and Himanshu Jain).

## Others

### A – Member of editorial advisory board of international journals

Vilar, R. is co-editor of "Lasers in Engineering", Old City Publishing Inc., New York and Member of the Editorial Boards of the following journals:

"International Journal of Materials and Product Technology", Inderscience Publishers, Switzerland.

"International Journal of Microstructure and Materials Properties", Inderscience Publishers, Switzerland,

"Revista da Escola de Minas", UFOP, Ouro Preto, Brasil.

"Revista de Metalurgia (Madrid)", CSIC, Madrid.

Rui M. Almeida is a member of the Advisory Editorial Boards of: Journal of Non-Crystalline Solids, Journal of Sol-Gel Science and Technology and Key Engineering Materials.

Montemor, M.F., member of the Editorial Board of the Journal Cement and Concrete Composites, pub Elsevier.

Simões, A.M.P., Member of the editorial board of Corrosão e Protecção de Materiais (INETI, Portugal)

Fernandes, J.C.S., Member of the e-editorial board of "Impedance Contributions Online", online publication at <http://accessimpedance.iusi.bas.bg/>

Ferreira, M.G.S., Member of the Editorial Board of the Journals, Materials and Corrosion/Werkstoffe und Korrosion, Journal of Corrosion Science & Engineering, Corrosion Reviews, Revista de Corrosão e Protecção dos Materiais, Portugliae Electrochimica Acta, Journal of the Corrosion Science Society of Korea.

### B – Reviewing of papers in international scientific journals

Vilar, R. is referee of the following international journals:

- Applied Surface Science;
- Journal of Applied Physics;
- Boletín de la Sociedad Española de Cerámica y Vidrio;
- Journal of Laser Applications;
- Journal of Manufacturing Science and Engineering;
- Journal of Materials Science;

- Journal of Physics: Condensed Matter;
- Lasers and Optoelectronics;
- Lasers in Engineering;
- Materials Research Bulletin;
- Materials Science Forum;
- Measurement Science and Technology;
- Nuclear Instruments and Methods B: Beam Interactions with Materials and Atoms;
- Revista da Escola de Minas (Brasil);
- Revista de Metalurgia (CENIM, Madrid);
- Surface and Coatings Technology;
- Wear.

M. S. Rogalski is referee of the following international journals:

- Journal of Physics C: Condensed Matter
- Journal of Physics D: Applied Physics

Carvalho, P. is referee of the following international journals:

- Philosophical Magazine;
- Materials Science Forum.

Colaço, R. is referee of the following international journals:

- Wear;
- Tribology Letters;
- Materials Science and Engineering;
- Surface and Coatings Technology;
- Journal of Materials Science;
- Materials Science Forum.

Deus, A. is referee of the following international journals:

- Metallurgical and Materials Transactions A;
- Applied Physics A.

Almeida, A. is referee of the following international journals:

- Materials Science Forum;
- Surface and Coatings Technology;
- Journal of Laser Applications;
- Journal of Materials Science.
- Materials Letters

Rui M. Almeida :

J. Non-Crystalline Solids  
 J. Sol-Gel Science and Technology  
 J. American Ceramic Society  
 J. of Applied Physics  
 Applied Physics Letters  
 Physical Review B  
 J. of Physics: Condensed Matter  
 Physica Status Solidi  
 Thin Solid Films  
 Optical Materials  
 J. of Materials Research  
 Advanced Functional Materials  
 Materials Science and Engineering B  
 J. of Alloys and Compounds  
 J. Materials Chemistry  
 Materials Chemistry and Physics  
 Chemistry of Materials  
 J. of Physical Chemistry C  
 Inorganic Chemistry  
 Langmuir  
 J. of Solar Energy Engineering

M. Clara Gonçalves:

Journal of Non-Crystalline Solids  
 Journal of Sol-Gel Science and Technology  
 Physica Status Solidi

Luís F. Santos:

J. Non-Crystalline Solids

Materials Letters

Montemor, M.F., Reviewer of international scientific journals, Surface and Coatings Technology: 3, Electrochimica Acta: 10, Journal of Electrochemical Society: 2, Cement and Concrete Composites: 2, Progress in Organic Coatings: 1

Simões, A.M.P., Reviewer of international scientific journals, Corrosion Science: 2, J. Applied Electrochemistry: 1, J. Journal of the Electrochemical Society: 1, Electrochimica Acta: 2.

Fernandes, J.C.S., Reviewer of Applied Surface Science and Progress in Organic Coatings.

Olinda Conde was a reviewer for the following journals: Applied Surface Science, Journal of Non-Crystalline Solids and Materials Letters.

C - Other

Montemor, M.F.:

Member of the Technical group 5 (TG5) for the monitoring of R&D activities of RFCS and ECSC steel related projects, European Commission.

Member of PhD evaluation committee of Wassim Trabelsi "Recherche de Nouveaux Prétraitements non Toxiques à Base de Molécules de Silane pour Protéger l'Acier Galvanisé Contre la Corrosion" Université 7 Novembre A Carthage; Institute National des Sciences Appliquées et de Technologie, Tunisia, 28 October 2006.

Simões, A.M.P.:

Member of PhD evaluation committee of Ana Maria da Gama Mateus Cabral, "Estudo de Filmes de Bis-[trietoxisililpropil] tetrasulfano (BTESPT) para pré-tratamentos anti-corrosivos da liga de alumínio 2024-T3", Instituto Superior Técnico (orientador: Prof. Mário G.S. Ferreira) July 2006.

D- Session chair

Rui M. Almeida was a Session Chair at 3 different international conferences, held in Palermo (Italy), Sunderland (UK) and Wenzhou (P.R. China).

E- Visiting Professor

Rui M. Almeida was a Visiting Professor at the Department of Physics/CeFSA, University of Trento (Italy), from October 3-9, 2006, doing collaborative photonic materials research with the group of Dr. Maurizio Ferrari and Prof. Maurizio Montagna. During this period, RMA was also a member of the Ph.D. Committee for the thesis defenses of two Ph.D. students at Trento University.

F- New Project

"Coordination action" EFONGA – European Forum on New Glass Applications, Contract nº NMP3-CT-2005-013983, Sixth Framework Programme (DG Research).

G- Scientific spreading and Promotion of Education through Scientific Experimentation

Explora os Materiais 2006 (Exploring Materials 2006)

Co-ordination of the one Month open Laboratory and Materials exhibition for high school and undergraduate students.

Visitants/explorers: 1700 high school students and 80 teachers from 33 high school and around 450 undergraduate students and 100 lecturers and professors from IST.

Vamos Brincar aos Materiais (Lets play with Materials)

Program for the promotion of Education via Materials Scientific Experimentation Activities in primary schools.

Project Vamos Brincar aos Materiais. (2006/05-2007/12). Financed by Agência Ciência Viva (60 000€). Project Coordinator A.C. Ferro  
Participants: 55 schools, 340 teachers, 5500 children.

H- Organization of Post-Graduated Courses and Programs

National Master Course on Materials Engineering (9th Edition)

Member of the Scientific Committee and Co-ordinator at IST

Co-ordinator of the modulus on Metals.

Post-Graduated Course on Materials in Engineering - Integrated Management of Quality and Environment

Responsible for the modulus on Processing of Metals.

**Data:** sexta-feira, 18 de Maio de 2007

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(assinatura do Responsável pelo Projecto)

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Governo da República Portuguesa



Programa Operacional Ciência e Inovação 2010

MINISTÉRIO DA CIÊNCIA, INOVAÇÃO E ENSINO SUPERIOR



Em congressos científicos internacionais	33	36
Em congressos científicos nacionais	9	11
C - Relatórios	4	6
D - Organização de seminários e conferências	2	4
E - Formação Avançada		
Teses de Doutoramento	0	0
Teses de Mestrado	0	1
Outra	0	1
F - Modelos	0	0
G - Aplicações computacionais	0	0
H - Instalações Piloto	0	0
I - Protótipos laboratoriais	0	0
J - Patentes	0	9

## Publicações em 2006

### Publications

#### A – Papers in international journals

Guerra Rosa, L., Lamon, J., Figueiredo, I., Oliveira, F.A.C., "A method to distinguish extrinsic and intrinsic fracture-origin populations in monolithic ceramics", *Journal of the European Ceramic Society*, 26: 3887–3895, 2006.

Guerra Rosa, L., Colella, A., Anjinho, C.A., "Effect of paraffin oil used as a lubricant in tensile tests of carbon fibre bundles", *Materials Science Forum*, 514-6: 672-676, 2006.

Amaral, P.M., Fernandes, J.C., Guerra Rosa, L., "A Comparison between X-ray Diffraction and Petrography Techniques used to determine the Mineralogical Composition of Granite and comparable Hard Rocks", *Materials Science Forum*, 514-6: 1628-1632, 2006.

Fernandes, J.C., Oliveira, F.A.C., Granier, B., Badie, J-M., Guerra Rosa, L., Shohoji, N., "Kinetic aspects of reaction between tantalum and carbon material (active carbon or graphite) under solar radiation heating", *Solar Energy Journal*, 80 (12): 1553-1560, 2006.

Amaral, P.M., Pozo, D., Pinto, S., Fernandes, J.C., Guerra Rosa, L., "Un metodo standard per classificare gli utensili diamantati impiegati nel campo della costruzione", *DIAMANTE Applicazioni & Tecnologia*, Anno 12, n° 44 (ISSN 1824-5765) pp. 37-53, 2006.

Oliveira, F.A.C., Dias, S., Fernandes, J.C., "Thermal shock behaviour of open-cell cordierite foams", *Materials Science Forum*, 514-6: 764-767, 2006.

Oliveira, F.A.C., Tavares, S., Domingues, J.R., Fernandes, J.C., Dias, D., "Optimisation of cordierite processing through Taguchi method", *Materials Science Forum*, 514-6: 1448-1451, 2006.

Oliveira, F.A.C., Delmas, F., Araujo, A., Fernandes, J.C., Dias, D., "Incorporation of aluminium residues in dense cordierite formulations", *Materials Science Forum*, 514-6: 1722-1725, 2006.

Carvalho, A. P., Vaz, M. Fátima, Samora, M. J., Pires, J., "Characterisation of ceramic pastes of portuguese ancient tiles", *Advanced Materials Forum III*, *Materials Science Forum*, 514-516, 1648-1652, 2006.

Carvalho, A. P., Mestre, A. S., Pires, J., Pinto, M. L., Rosa, M. Emília, "Granular activated carbons from powdered samples using clays as binders for the adsorption of organic vapours", *Microporous and Mesoporous Materials*, 93, 226-231, 2006.

Martorano, M. A., Fortes, M. A., Padilha, A. F., "The growth of protrusions at the boundary of a recrystallized grain", *Acta Materialia*, 54, 2769-2776, 2006.

Oliveira, F. A., Dias, S., Vaz, M. Fátima and Cruz Fernandes, J., "Behaviour of open-cell cordierite foams under compression", *Journal of the European Ceramic Society*, 26, 179-186, 2006.

Pereira, Cristina S., Soares, Giselle A. M., Oliveira, Ana C., Rosa, M. Emília, Pereira, Helena, Moreno, Nuno, San Romão, Maria Vitória, "Effect of fungal colonization on mechanical performance of cork", *International Biodeterioration and Biodegradation*, 57, 244-250, 2006.

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#### B – Papers in national journals

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#### C – Books and chapters of books

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#### Communications

##### A – In international meetings

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Oliveira, F. A. Costa, Vaz, M. Fátima, Cruz Fernandes, J., Ranito, C., Dias, C., Matos, M. J., "Manufacturing and structural characterisation of open-cell ceramic foams", 6th European Conference on Foams, Emulsions and Applications, Potsdam-Germany, July, 2006.

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Carreira, F., Canas, T., Silva, A., Cardeira, C., "i-MERC: A mobile robot to deliver meals inside health services", 2006 IEEE International Conferences on Cybernetics & Intelligent Systems (CIS) and Robotics, Automation & Mechatronics (RAM), Bangkok, Thailand, 7-9 June, 2006.

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Marat-Mendes, R., Freitas, M., "Experimental and Numerical Studies of Mode I, II, III and Mixed-mode I-II Energy Release Rate in

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Navarro, F.J., Partal, P., Martinez-Boza, F., Gallegos, C., Correia, C., Correia, N., Bordado, J., Diogo, A. C. – Rheological properties of bitumen modified with a reactive MDI-prepolymer.  
– 3rd Annual European Rheology Conference AERC 2006, Hersonisos, Creta (Grécia), 27-29 Abril 2006.

## B – In national meetings

Freitas, M., Reis, L., Li, B., “Influences of multiaxial fatigue loading on the crack path”, 10th Portuguese Conference on Fracture, Guimarães, 22-24 February 2006.

Romeiro, F., Fonte, M., Freitas, M., “The Environment Effect on Fatigue Crack Growth using a new Chamber of Vacuum”, 10th Portuguese Conference on Fracture, Guimarães, 22-24 February, 2006.

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Reis, L., Fonseca, A., Freitas, M., Milharadas, M., “Avaliação da integridade de estruturas aeronáuticas”, Jornadas Aeronáuticas da Covilhã – JAC 2006, Núcleo de Aeronáutica da UBI, Covilhã, Portugal, 26 April, 2006.

Cláudio, R.A., J.M. Silva, Branco, C.M., Byrne, J. “Crack propagation behaviour of shot peened components at elevated temperature”, Proc. 10th. Portuguese Conf. Fract.,Ed. SPM, Guimarães, U. Minho, pp 25, 2006.

Duarte, P., Infante, V., Branco, C.M., “Fatigue design of a coupling joint used in railway carriages, Proc. 10th. Portuguese Conf. Fract.,Ed. SPM, pp. 70, 2006.

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Morgado, T.L.M., Branco, C.M., Infante, V., "A fatigue study of housing of the gearboxes of series 2600 locomotives of the portuguese railway company", Proc. 10th. Portuguese Conf. Fract.,Ed. SPM, pp.81, 2006.

Cláudio, R. A., Branco, C. M., Byrne, J., "Numerical calibration of electric potencial difference for crack size monitoring", Proc. 10th. Portuguese Conf. Fract.,Ed. SPM, pp.86, 2006.

Baptista, R., Infante, V. Branco, C.M., "Study of the fatigue behaviour in welded joints of stainless steels, Proc. 10th. Portuguese Conf. Fract.,Ed. SPM, pp. 94, 2006.

Cabral, Marta,Chambel, C.M., Bastos, A.J., Figueiredo, P., Ribeiro, C.J., Matias, M.J., Bordado, J.C., Diogo, A. C., Margarido, F., "Valorização de resíduos provenientes das actividades militares", IV Jornadas Técnicas de Engenharia Logística Militar, Paço-de-Arcos, 29th November, 2006.

#### Technical reports

- "12 Months Periodic activity report" (Period covered: 1st July 2005 / 30th June 2006) of Project no.COLL-CT-2005-516417 PRO-STONE, Date of preparation: 26.07.2006.

- "Modelling of quasi-static propagation of cracks and fractures in stone blocks", Deliverable D12 of Project no.COLL-CT-2005-516417 PRO-STONE, Date of preparation: 01.08/2006.

- "Characterisation of Stone Mechanical Properties", Deliverable D11 of Project no.COLL-CT-2005-516417 PRO-STONE, Date of preparation: 19.09.2006.

M. Freitas e L. Reis, "Ensaio de fadiga em aços da estrutura da ponte de Portimão", Relatório técnico para empresa OZ – Diagnóstico, January, 2006.

Branco, C.M. "Stress analysis of a front cabin of a Caterpillar wheel car", STET company, March 2006, 60 pages.

Branco, C.M., Sousa Brito, A., "Microstructure and Mechanical Behaviour of the cables of the Penacova bridge", work for the EP company, Portuguese road company. August 2006, 66 pages. (confidential report)

#### Meetings organization

##### A – Organization of national or international conferences

Guerra Rosa, L. was member of the organizing committee of the Symposium "Nanotecnologias em Portugal: Ciência, Indústria e Sociedade", an initiative of Academia de Engenharia held on 28th November 2006, at Ordem dos Engenheiros, Lisboa.

Prof. Arlindo Silva - Coordenador do Symposium on Product Engineering and Development in Design, integrado na 5th International Conference in Mechanics of Materials in Design, Porto, 24-26 Julho, 2006.

Virginia Infante, member of organizing committee of ICEFA-II, Second International Conference on Engineering Failure Analysis, Toronto, Canada, 12-15 September 2006.

Carlos Moura Branco, Edgar Gomes, Ricardo Cláudio, Virginia Infante, members of organizing and scientific committees of the 10th. Portuguese Conference on Fracture, Guimarães, University of Minho 22-24 February 2006.

##### B – Member of conferences scientific committees

Prof. Arlindo Silva - Membro do Comité Internacional da série de conferências 2006 IEEE International Conferences on Cybernetics & Intelligent Systems (CIS) and Robotics, Automation & Mechatronics (RAM)(CIS-RAM 2006) 7 - 9 June 2006, Bangkok, Thailand

A. C. Diogo is member of the International Advisory Board of "European Polymer Congress – 2007" organised by the European Polymer Federation (Portoroz, Eslovenia, 2-6 July 2007).

#### Advanced training

##### A – PhD Thesis

Nadya Dencheva, "Development of novel nanostructured composites based on in situ reinforced polymers", supervisor: Teresa Nunes, starting Date: 2003/10/1

##### B – Master Thesis

Marta Ferreira (in collaboration with FCUL), "Caracterização Estrutural da Talha Dourada da Caixa do Orgão da Igreja de Santa Cruz de Coimbra", Co – Supervisor: Fátima Vaz (IST), Supervisor: Ana Paula Carvalho (FCL), finished in December,2006.

##### C - Other

Carolina Erhart and Jatyr Proença, respectively Post-Doc and PH D students at the University of Granada (Spain), collaborated, under the supervision of Teresa Nunes, in the NMR and MRI studies of three commercially available adhesives (August-September).

#### Patents

"Mecanismo e assento de ajuda ao transporte para o interior da banheira". Pedido de Patente de Invenção Nacional em Portugal PT 103 498, de 8 de Junho de 2006. Titulares: Instituto Superior Técnico, Joana Arina e Inês Santos. Inventores: Joana Arina, Inês Santos e Arlindo Silva. Boletim da Propriedade Industrial nº10, 2006, pp 4401 (Apêndice ao Diário da República de 31/Outubro/2006).

"Sandwich de materiais compósitos com núcleo composto de cortiça". Pedido de Patente de Invenção Nacional em Portugal PT 103 504, de 21 de Junho de 2006. Titulares: Instituto Superior Técnico, João Sousa e Luis Gonçalves. Inventores: Arlindo Silva; João Sousa; Luis Gonçalves. Boletim da Propriedade Industrial nº10, 2006, pp 4402 (Apêndice ao Diário da República de 31/Outubro/2006).

"Método de alteração aerodinâmica e estética de um veículo de competição". Pedido de Patente de Invenção Nacional em Portugal PT 103

505 de 21 de Junho de 2006. Titulares: Instituto Superior Técnico, João Sousa e Luis Gonçalves. Inventores: Arlindo Silva, João Sousa, Luis Gonçalves. Aguarda publicação em Diário da República.

"Sistema automático de mudança de ferramentas de um berbequim". Pedido de Patente de Invenção em Portugal PT 103 523 de 12 de Julho de 2006. Titulares: Instituto Superior Técnico, Luis Frederico, Nelson Ferreira, Francesco Piaceri. Inventores: Arlindo Silva, Luis Frederico, Nelson Ferreira, Francesco Piaceri. Boletim da Propriedade Industrial nº10, 2006, pp 4403 (Apêndice ao Diário da República de 31/Outubro/2006).

"Tenda de campismo insuflável com estrutura modular". Pedido de Patente de Invenção em Portugal PT 103 531 de 19 de Julho de 2006. Titulares: Instituto Superior Técnico, André Cruz, João Caetano e João Emílio. Inventores: Arlindo Silva, André Cruz, João Caetano e João Emílio. Aguarda publicação em Diário da República.

"Dispositivo de escrita manual dotado de películas aderentes". Pedido de Patente de Invenção em Portugal PT 103 533 de 20 de Julho de 2006. Titulares: Instituto Superior Técnico, Luis Oliveira; Nuno Ruben e Rui Pinto. Inventores: Arlindo Silva, Luis Oliveira; Nuno Ruben e Rui Pinto. Boletim da Propriedade Industrial nº12, 2006, pp 5227 (Apêndice ao Diário da República de 29/Dezembro/2006).

"Desentupidor". Pedido de Patente de Invenção em Portugal PT 103 537 de 25 de Julho de 2006. Titulares: Instituto Superior Técnico, Pedro Gil e Sergio Blazer. Inventores: Arlindo Silva, Pedro Gil e Sergio Blazer. Aguarda publicação em Diário da República.

"Aparelho do tipo ortótese tornozelo-pé". Pedido de Patente de Invenção em Portugal PT 103 538 de 25 de Julho de 2006. Titulares: Instituto Superior Técnico, André Santos e Adelino Fernandes. Inventores: Arlindo Silva, Miguel Silva, André Santos e Adelino Fernandes. Boletim da Propriedade Industrial nº12, 2006, pp 5227 (Apêndice ao Diário da República de 29/Dezembro/2006).

"Ferramenta multi-usos". Pedido de Patente de Invenção em Portugal PT 103 548 de 1 de Agosto de 2006. Titulares: Instituto Superior Técnico, Eurico Assunção. Inventores: Arlindo Silva, Eurico Assunção. Boletim da Propriedade Industrial nº12, 2006, pp 5228 (Apêndice ao Diário da República de 29/Dezembro/2006).

## Others

A – Reviewing of papers in international scientific journals

Guerra Rosa, L. was reviewer of papers submitted to the journals entitled:

- "Fatigue and Fracture of Engineering Materials and Structures"
- "Mechanics of Advanced Materials and Structures"

M. Emília Rosa - Referee for Holzforschung.

M. F. Vaz - Referee for Philosophical Magazine Letters, Soft Matter (Royal Society of Chemistry) and Colloids and Surfaces A: Physicochemical and Engineering Aspects.

Prof. Arlindo Silva - International Journal of Mechanics & Materials in Design

Prof. Arlindo Silva - Membro de um painel de avaliação externo da Agência de Inovação na área de Engenharia Mecânica.

Virginia Infante, member of Editorial Advisory Board of "Engineering Failure Analysis" Journal, ELSEVIER, since February 2005.

During 2006, Nunes, Teresa G. was a referee for several international journals, including Medical Engineering & Physics (Elsevier, Official Publication of the Institute of Physics and Engineering in Medicine) and Applied Magnetic Resonance (Springer).

## B- International Committees

Member of the Committee of the Society AMPERE (Nunes, Teresa G., elected for a second term).

Member of the European Polymer Federation Committee (Diogo, A. C.)

Diogo, A. C. was President of one session of the Symposium on Biopolymers, Biorheology and Food Rheology of AERC 2006: 3rd Annual European Rheology Conference" (Hersonisos, Crete, Greece, 27-29 April 2006)

Member of the International Committee of Rheology (Diogo, A. C.)

Member of the Committee of the European Society of Rheology (Diogo, A. C.)

**Data:** sexta-feira, 18 de Maio de 2007

(assinatura do Responsável pelo Projecto)

18-05-2007 - 14:20



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