RNME - REDE NACIONAL DE MICROSCOPIA ELECTRÓNICA

NATIONAL ELECTRON MICROSCOPY NETWORK

RNME – Pole of Instituto Superior Técnico

INSTITUTO SUPERIOR TÉCNICO

ICEMS
INSTITUTO DE CIÊNCIA E ENGENHARIA DE MATERIAIS E SUPERFÍCIES
INSTITUTE OF MATERIALS AND SURFACES SCIENCE AND ENGINEERING

MicroLab – Laboratório de Microscopia Electrónica

ACTIVITY REPORT
2011

1. Global characterization of the Pole activity and progress in the year2011

The MicroLab-Laboratory of Electron Microscopy is a state-of-the-art facility on IST campus whose mission is to provide high-end electron microscopy services. The laboratory is open for use by students, faculty and staff of IST or other universities and institutes, as well as commercial groups with a need for the analytical services the lab can provide.

During 2011 the number of individual users of the MicroLab's facilities was 163, corresponding to 1033 hours of use of the FEG-SEM JEOL JSM7001F, 612 hours of the SEM Hitachi S2400 and 402 hours of the TEM Hitachi H8100 II.

The number of users from commercial groups has increased, although it is still low when compared to users from the research community (81h versus 1965h).

As part of our ongoing effort to improve the services available and meet the needs of our multiple users we have acquired a new equipment for sputter coating (with a chromium target) and carbon evaporation, model Q150T ES from Quorum Technologies. It is an essential instrument for sample preparation both for SEM and for TEM.

In the past year our laboratory organised a one day SEM-Scanning Electron Microscopy Course, intended to introduce researchers and commercial companies to SEM techniques and their applications, including practical demonstrations.

We also organized a seminar for other network members, with the aim of presenting our facilities and demonstrating the specific capabilities of our different instruments.

2. Resources and operation conditions

2.1 Material resources.

MICROSCOPES

HR-SEM-SE/EDS: SEM (JEOL JSM-7001F) with elemental and diffraction pattern analysis (Oxford INCA 250)

Field Emission Scanning Electron Microscope with Schottky (SE) emission gun, resolution of 1.2 nm at 15kV, equipped with secondary and backscattered electron detectors, Energy Dispersive Spectrometer (EDS) with light elements detector and a system for detecting and processing electron backscattered diffraction patterns (EBSD).

SEM/EDS: SEM (Hitachi S-2400) with elemental analysis (Bruker)

Scanning Electron Microscope with thermionic (W) emission gun, resolution of 5nm at 25kV, equipped with secondary and backscattered electron detectors, Energy Dispersive Spectrometer (EDS), and digital image acquisition and analysis.

CTEM: TEM (Hitachi H-8100 II) with elemental analysis (ThermoNoran Noran SystemSix)

200 kV Transmission Electron Microscope with thermionic emission gun (LaB6), point to point resolution of 2.7 Å, equipped with an Energy Dispersive Spectrometer (EDS) with light elements detector, double-tilt Gatan sample-holder for electron diffraction studies (sample tilts 90º on one direction and 60º on the normal direction) and digital image acquisition with a CCD MegaView II bottom-mounted camera.

ANCILLARY EQUIPMENT

High vacuum metal sputtering and carbon evaporation coater for FEG-SEM and TEM sample preparation (Quorum Technologies model Q150T ES).

Ion mill for TEM thin foil preparation (Gatan Duomill 600F)

Electroerosion unit for TEM disc preparation (Tecnoorg Linda)

Dimpler for TEM thin foil preparation (South Bay Technology D500i)

Optical microscope (Cole-Palmer) for sample preparation support

Desiccation chamber for sample storage (Pelco 2251).

2.2. Human resources supporting the experimental facilities operation

Scientific and technical resources

Name	Degree	Contract Category	Function in the RNME	RNME (h/week)
Rui Vilar	PhD	Full Professor	MicroLab Supervisor	5
Amélia Almeida	PhD	Assistant Professor	Formation and scientific advisor	5
Patrícia Carvalho	PhD	Assistant Professor	Formation and scientific advisor	5
Isabel Nogueira	MSc	Technician	Sample preparation, FEG-SEM, SEM and TEM operator, maintenance	100

2.3. Rules and access conditions to the electron microscopy experimental facilities

The MicroLab-Electron Microscopy Laboratory is available to anyone wishing to use its facilities, but different hourly rates are applied to ICEMS members, Instituto Superior Técnico researchers and students, and researchers of other universities, institutes and industrial companies.

The facility is available both as a user-run facility by authorized independent users or as a service, with technical assistance of a highly trained technician. Reservation is done through a web based booking system accessible at http://icems.ist.utl.pt/booking.html.

In order to increase the equipment available time MicroLab allows intensive users of the facility to operate the equipment independently during off regular hours (e.g. before 9h00, after 17h00 and during weekends and holidays).

MicroLab has a full-time laboratory technician responsible for the operation of all equipment, maintenance, online booking and support to independent users.

User fees are listed on http://groups.ist.utl.pt/microlab/pdfs/tabela_2010.pdf.

Further information can be found on the website http://icems.ist.utl.pt/services.html.

3. Training activities.

3.1 Training, information and demonstration activities addressed to researchers and to other users of the RNME

MicroLab organises personalized training sessions for intensive users who wish to operate the equipment independently.

This training includes:

1. Theoretical introduction lectured by the laboratory technician;
2. A minimum of 6 hours of practical sessions with full support of the laboratory technician;
3. A minimum of 12 hours of practical sessions supervised by the laboratory technician.

This training schedule is flexible and is adjusted taking into consideration the previous experience and knowledge of the user.

If the training is successful the laboratory technician will authorise the new user to book the equipment online directly and to access the laboratory off working hours.

In addition, the MicroLab organised a demonstration of its facilities for users of the other laboratories of the RNME (19th of December 2011), attended by professors, researchers and microscopy operators of University of Aveiro and CEMUP (Porto).

Training, information and demonstration activities

Seminars	Full Duration Days / Hours	Date	Participants
RNME-Seminar for network users	1 day	19/12	Universidade de Aveiro: Professor Doutor Joaquim Vieira; Professor Doutor Augusto Lopes; Doutora Florentina Maxim; Mestre Marta Ferro; Mestre Bruno Almeida CEMUP: Doutora Daniela Silva Doutor Rui Rocha

Training of equipment users/operators	Full Duration Days / Hours	Date	Participants
SEM Hitachi S2400	18h	25/1-18/2	Pedro Nolasco
SEM Hitachi S2400	18h	10/3-18-3	Ana Cândido
SEM Hitachi S2400	24h	6/6-17/6	Ana Anjos
SEM Hitachi S2400	12h	11/7-27/7	Sharma Sahendra
FEG-SEM JEOL JSM7001F	12h	27/1-16/2	Fabiola Brusciotti
FEG-SEM JEOL JSM7001F	12h	18/3-24/3	Yegor Mozorov
FEG-SEM JEOL JSM7001F	18h	3/3-23/3	Tomin Liu
FEG-SEM JEOL JSM7001F	18h	14/3-31/3	Mirela Lourenço
FEG-SEM JEOL JSM7001F	12h	7/2-21/2	Renato Baldan
FEG-SEM JEOL JSM7001F	18h	25/7-17/8	Margarida Henriques
FEG-SEM JEOL JSM7001F	12h	23/9-28/9	Sharma Sahendra
FEG-SEM JEOL JSM7001F	12h	20/10-9/11	Huibin Xue
FEG-SEM JEOL JSM7001F	24h	23/11-21/12	Ana Anjos
TEM Hitachi H8100	12h	7/7-25/7	Sharma Sahendra
TEM Hitachi H8100	24h	24/6-8/7	Javad Hatami
TEM Hitachi H8100	18h	9/7-25/7	Cristina Neves
TEM Hitachi H8100	18h	7/9-7/10	Pedro Nolasco

3.2 Teaching, training, information and demonstration activities

In the frame of the University curricular activities

	Curricular units Course Discipline	Course Faculty / University
PhD course 3rd cycle	Materials Characterisation	Materials Engineering-IST
Master course 2nd cycle	Materials Characterisation	Materials Engineering-IST
Master course 2nd cycle	Biomaterials II	Biomedical Engineering-IST
Master course 2nd cycle	Project in Bioengineering and Nanosystems	Bioengineering and Nanosystems-IST
Master course 2nd cycle	Project in Materials Engineering	Materials Engineering-IST
Degree course 1st cycle	Introduction to Materials Engineering	Materials Engineering-IST
Degree course 1st cycle	Testing and Materials Characterisation	Materials Engineering-IST

Study visits to the MicroLab

Date		Course Discipline	Course School/University	Number of Students
10/10	Degree course 1st cycle	Materials	Technological Chemistry FCUL	20
19/5	Degree course 2nd cycle	Materials Science and Technology	Physics Engineering FCUL	10
25/10	Degree course 2nd cycle	Structure and Characterisation of Surfaces and Interfaces	Chemistry Technological Chemistry FCUL	12
28/3	High School	Biology	10th grade Colégio Sagrado Coração de Maria	80
4/5	High School	Biology	10th grade Colégio Sagrado Coração de Maria	40

FCUL - Faculdade de Ciências da Universidade de Lisboa
IST - Instituto Superior Técnico

4. Electron Microscopy service activity and collaboration in research and development projects

4.1 Electron Microscopy service activity

For the calculation of each instrument's downtime we have considered 100% ineffectiveness if the equipment was completely inoperative, and lower values of ineffectiveness if it was still operative but with limitations.

The yearly number of hours considered possible was 1600 hours minus the downtime for each instrument. The number 1600 hours was determined by considering 47 working weeks in 2011 (the 5 weeks removed corresponds to vacations and holidays).

Instrument: FEG-SEM JEOL JSM7001F

User Class Application	Number Of Users	Number of Work Sessions	Number of Hours
Visitors	162	9	15h00
Classes	55	14	35h00
Training activities	13	52	196h00
Courses	13	2	6h30
Teachers / Researchers (PhD)	33	105	177h05
Researchers (PhD) (under Research Grant contract)	18	71	109h55
PhD Students	48	191	312h30
MSc Students	19	55	105h10
Public and private companies (Industry and Services)	7	39	76h10
TOTAL	**368**	**538**	**1033h20**

Duration (working hours)	Description	Ineffectiveness	Downtime (working hours)
18h00	Power cuts with previous warning	100%	18h00
44h30	Minor repairs or calibrations	100%	44h30
189h00	Operative but without EBSD	10%	18h54
77h00	No electron beam (high voltage fault)	100%	77h00
14h00	Scheduled maintenance	100%	14h00
		TOTAL:	**172h24**

The FEG-SEM had a total use of approximately 1033 hours, from 1428 hours possible (1600 – 172 hours). This corresponds to 72% usage time and an average duration of each session of nearly 2 hours.

Downtimes of this instrument due to scheduled maintenance had a small contribution to the total downtime, which was mostly due to unexpected malfunctions or external problems.

Instrument: SEM Hitachi S2400

User Class Application	Number of Users	Number of Work Sessions	Number of Hours
Visitors	120	6	8h00
Classes	16	5	13h00
Training activities	4	18	66h00
Courses	6	1	3h30
Teachers / Researchers (PhD)	15	41	75h25
Researchers (PhD) (under Research Grant contract)	3	25	45h30
PhD Students	9	105	301h25
MSc Students	5	32	95h00
Public and private companies (Industry and Services)	1	2	4h15
TOTAL	**179**	**235**	**612h05**

Duration (working hours)	Description	Ineffectiveness	Downtime (working hours)
18h00	Power cuts with previous warning	100%	18h00
21h00	W filament exchange	100%	21h00
14h00	Electron gun misalignment	100%	14h00
7h00	Scheduled maintenance	100%	7h00
		TOTAL:	**60h00**

The SEM had a total use of 612 hours, from a total of 1540 hours possible (1600 – 60 hours). It corresponds to 40% usage time with an average session duration of approximately 2,5 hours.

This microscope had a large decrease in its utilisation when the FEG-SEM was acquired (in 2007). However, it is still largely used by students and researchers and provides quality work, although it needs to be updated. The main difficulty of this equipment lies in its digital image acquisition system and EDS hardware and software, which are both obsolete.

Downtimes of the SEM S2400 due to scheduled maintenance also added very little to the total downtime, which was mostly due to external problems.

Instrument: TEM Hitachi H8100II

User Class Application	Number of Users	Number of Work Sessions	Number of Hours
Visitors	132	7	11h00
Classes	52	5	8h00
Training activities	4	17	62h00
Courses	7	1	3h00
Teachers / Researchers (PhD)	18	57	92h45
Researchers (PhD) (under Research Grant contract)	6	13	18h40
PhD Students	22	84	186h55
MSc Students	4	18	18h20
Public and private companies (Industry and Services)	1	1	1h00
TOTAL	**246**	**203**	**401h40**

Duration (working hours)	Description	Ineffectiveness	Downtime (working hours)
18h00	Power cuts with previous warning	100%	18h00
7h00	LaB6 filament exchange	100%	7h00
140h00	PC inoperative, TEM without image acquisition	100%	140h00
7h00	Scheduled maintenance	100%	7h00
3h00	W filament exchange	100%	3h00
315h00	Operative but with W filament	50%	157h30
		TOTAL:	**332h30**

The TEM had a use of 401 hours in 2011, from a total of 1268 hours possible (1600 – 332 hours). This means that the microscope had 32% usage time with an average session of 2 hours.

Downtimes of this instrument were mainly caused by malfunctions or hardware problems.

For more information on the distribution of user time for each microscope and in accordance with user affiliation please see the Annex.

Users List

Teachers / Researchers (PhD)	Department Faculty	University Institution	SEM S2400	FEG-SEM 7001F	TEM H8100
Nunes de Carvalho	ICEMS	FCT		X	
Ana Paula Soares	ICEMS	IST		X	
Fátima Vaz	ICEMS	IST		X	
Emília Rosa	ICEMS	IST		X	
Manuel Freitas	ICEMS	IST	X		
Luís Reis	ICEMS	IST	X		
Virgínia Infante	ICEMS	IST		X	
Clara Gonçalves	ICEMS	IST			X
Correia Diogo	ICEMS	IST		X	
Rui Lobo	ICEMS	IST		X	X
Reinhard Schwarz	ICEMS	IST		X	
Patrícia Carvalho	ICEMS	IST	X	X	X
Amélia Almeida	ICEMS	IST	X		
Vitor Oliveira	ICEMS	ISEL	X		
António Silvestre	ICEMS	ISEL		X	X
Mafalda Guedes	ICEMS	EST-IPS	X	X	
Alexandra Rodrigues	ICEMS	EST-IPS	X	X	

Maria João Carmezim	ICEMS	EST-IPS		X	
Rafaela Cardoso	Civil	IST	X		
Amélia Dionísio	Minas	IST	X	X	X
Frederico Ferreira	Química	IST	X		
Fátima Farelo	Química	IST	X		
Filipa Ribeiro	Química	IST		X	X
Gomes de Azevedo	Química	IST		X	
Carlos Baleizão	Química	IST			X
Cândida Vaz	Química	IST		X	
António Dente	Electrotécnica e de Computadores	IST		X	
Sofia Oliveira	-	Medicina Dentária	X		
Manuela Lopes	-	Medicina Dentária		X	X
Manuela Carrott	Química	Univ. Évora			X
Carla Costa	Civil	ISEL		X	
Teresa Valente	Ciências da Terra	Univ. Minho		X	X
Carlos Pereira	Química	Univ. Porto			X
João Sotomayor	Química	FCT-UNL	X		
Teresa Casimiro	Química	FCT-UNL		X	
Luísa Neves	Química	FCT-UNL		X	
João Rosa	Química	FCT-UNL			X
Isabel Fonseca	Química	FCT-UNL			X
Célia Henriques	Física	FCT-UNL		X	X
Clarisse Nunes	-	LNEG		X	
Teresa Gasche	-	LNEG			X
Magdalena Kowacz	-	ITQB		X	

Ana Nunes	-	ITQB		X	
Carla Jorge	-	ITQB			X
Helena Pereira	Eng. Florestal	ISA	X		
Isabel Miranda	Eng. Florestal	ISA	X		
Anabela Boavida	Química	FCUL		X	
Maria de Deus Carvalho	Química	FCUL		X	X
Inês Fonseca	Química	FCUL		X	
Olinda Monteiro	Química	FCUL		X	X
Ana Paula Carvalho	Química	FCUL			X
Marília Peres	Química	FCUL			X
Agnés Le Gac	-	IPCR		X	
Ana Paula Serro	-	ISCSEM		X	

Researchers (PhD) (under Research Grant contract)	**Department Faculty**	**University Institution**	**SEM S2400**	**FEG-SEM 7001F**	**TEM H8100**
Shantinarayan Rout	ICEMS	FCUL		X	
Saikat Dalui	ICEMS	FCUL		X	
Fabiola Brusciotti	ICEMS	IST	X	X	
Huibin Xue	ICEMS	IST		X	
José Salgado	ICEMS	IST		X	X
Luís Fortes	ICEMS	IST		X	
Yigang Li	ICEMS	IST		X	
Rachid Ayouchi	ICEMS	IST		X	
Soumya Bhattacharyya	ICEMS	IST		X	
Sharma Sahendra	ICEMS	IST	X	X	X

Elisabete Silva	Química	IST	X	X	
Auguste Fernandes	Química	IST		X	X
Miguel Rodrigues	Química	IST		X	
Neli Bundaleska	IPFN	IST		X	
Júlio Henriques	IPFN	IST		X	
Mariana Chirea	Química	Univ. Porto			X
Inês Peça	Química	FCT-UNL		X	
Manoj Gawande	Química	FCT-UNL			X
Susana Sério	Química	FCUL		X	
Ana Mourato	Química	FCUL		X	

PhD Students	**Department Faculty**	**University Institution**	**SEM S2400**	**FEG-SEM 7001F**	**TEM H8100**
Sónia Eugénio	ICEMS	IST	X	X	X
Andreia Marques	ICEMS	IST	X		
Amir Zomoridian	ICEMS	IST		X	
Darya Snihirova	ICEMS	IST		X	
Catarina Santos	ICEMS	IST		X	X
Yegor Mozorov	ICEMS	IST		X	
Ricardo Pinto	ICEMS	IST		X	
Artur Bento	ICEMS	IST		X	X
Filipe Nunes	ICEMS	IST		X	
Carlos Anjinho	ICEMS	IST	X	X	
Vera Pires	ICEMS	IST		X	
Hellen Prata	ICEMS	IST		X	
Paulo Brito	ICEMS	IST		X	

Ana Anjos	ICEMS	IST	X	X	
Pedro Nolasco	ICEMS	IST	X	X	X
Daniela Nunes	ICEMS	IST		X	X
Marta Dias	ICEMS	IST		X	
Bruno Nunes	ICEMS	IST		X	
Rodrigo Mateus	ICEMS	IST		X	
Javad Hatami	ICEMS	IST			X
Carole Loable	ICEMS	IST	X	X	
Alexandre Cunha	ICEMS	IST	X	X	
Anandkumar Ramasamy	ICEMS	IST		X	
Renato Baldan	ICEMS	IST		X	
Margarida Henriques	ICEMS	IST		X	
Ulisses Fernandes	Mecânica	IST		X	
Gongliang Wang	Mecânica	IST		X	
Miriam Sousa	Química	IST	X		X
Clara Sá Couto	Química	IST			X
João Cavalheiro	Química	IST		X	
Beatriz Nobre	Química	IST		X	
Luís Lopes	Química	IST		X	X
Raquel Teixeira	Química	IST			X
Cláudia Silva	Química	IST			X
Ana Parreira	Química	IST			X
Tânia Ribeiro	Química	IST			X
Sofia Martins	Química	IST			X
Ana Miller	Minas	IST		X	
Jaime Puna	Química	ISEL		X	

Pedro Silva	Civil	ISEL	X		
Maria Alzira Cavacas	-	Medicina Dentária		X	
Pedro Quaresma	-	Univ. Porto			X
Cristina Neves	-	Univ. Porto			X
Vaibhave Aggarwal	-	Univ. Porto			X
Teresa Santos		Univ. Porto		X	
Marta Corvo	Química	FCT-UNL		X	
Raquel Viveiros	Química	FCT-UNL		X	
Telma Barroso	Química	FCT-UNL		X	
Margarida Coelho	Química	FCT-UNL		X	
Ana Rita Ricardo	Química	FCT-UNL		X	
Mathilda Larsson	Química	FCT-UNL		X	
Vanessa Correia	Química	FCT-UNL		X	
Nuno Neves	Materiais	FCT-UNL			X
Andreia Ruivo	Química	FCT-UNL			X
Rita Carvalho	Química	FCT-UNL			X
Sofia Cardoso	Eng. Florestal	ISA		X	
Ana Viana	Química	FCUL		X	
Tânia Frade	Química	FCUL		X	
Virgínia Ferreira	Química	FCUL		X	X
Cristina Fernandes	Química	FCUL		X	X
Catarina Duarte	Física	FCUL		X	X
Pedro Parreira	-	LNEG		X	
Diego Hartmann		ITQB		X	
Ana Almeida	-	ITQB		X	

MSc Students	Department Faculty	University Institution	SEM S2400	FEG-SEM 7001F	TEM H8100
Ana Fernandes	ICEMS	IST		X	
Lorena Freire	ICEMS	IST		X	
Miguel Castilho	ICEMS	IST	X		
Lígia Figueiredo	ICEMS	IST		X	
Giulia Smonker	ICEMS	IST		X	
Ana Carina Lobato	ICEMS	IST		X	
Lúcia Santos	ICEMS	IST		X	
Gonçalo Monteiro	ICEMS	IST		X	
Ana Sabino	ICEMS	IST			X
Rui Colaço	ICEMS	IST			X
Marta Faria	ICEMS	IST			X
Ana Cândido	ICEMS	IST	X	X	
Tomin Liu	ICEMS	IST	X	X	
Mirela Lourenço	ICEMS	IST		X	X
Liliana Cangueiro	ICEMS	IST		X	
Tiago Pinto	Mecânica	IST		X	
Pedro Bettencourt	Mecânica	IST		X	
Henrique Almeida	Mecânica	IST		X	
João Valente	Mecânica	IST		X	
Raphael Canadas	Química	IST	X		
Marta Costa	Química	IST	X		
Ana Martins	Química	IST		X	
Anabela Coelho	Química	IST		X	
Liliana Martelo	Química	IST		X	
Nilda Barreto	Química	FCT-UNL		X	

EST-IPS - Escola Superior de Tecnologia do Instituto Politécnico de Setúbal
FCT-UNL - Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa
FCUL - Faculdade de Ciências da Universidade de Lisboa
ICEMS - Instituto de Ciência e Engenharia de Superfícies
IPCR – Instituto Português de Conservação e Restauro
ISA - Instituto Superior de Agronomia
ISCSEM - Instituto Superior de Ciências da Saúde Egas Moniz
ISEL - Instituto Superior de Engenharia de Lisboa
IST - Instituto Superior Técnico
ITQB - Instituto de Tecnologia Química e Biológica
LNEG – Laboratório Nacional de Energia e Geologia

Public and private companies (Industry and Services)	**SEM S2400**	**FEG-SEM 7001F**	**TEM H8100**
Hospital Curry Cabral			X
Ambigovernance		X	
Medbone		X	
Geosolve		X	
CENFIC		X	
YD Ynvisible SA		X	
Hovione FarmaCiência SA	X	X	
CIMPOR		X	

4.2 Examples of publications generated or with reference to electron microscopy experiments made in this Pole of the RNME

FEG-SEM

G.L.M. Santa, M.S.A. Bernardino, S. Magalhães, V. Mendes, M.P.C. Marques, L.P. Fonseca, P. Fernandes, *From Inulin to Fructose Syrups Using Sol–Gel Immobilized Inulinase*, Applied Biochem Biotechnol, Vol 165, 1-12, 2011

S. Bernardino, N. Estrela, V. Ochoa-Mendes, P. Fernandes, L.P. Fonseca, *Optimization in the immobilization of penicillin G acylase by entrapment in xerogel particles with magnetic properties*, Journal of Sol Gel Science and Technology, Vol 58, 545-556, 2011

P. Matias, C. Sá Couto, I. Graça, J.M. Lopes, A.P. Carvalho, F. Ramôa Ribeiro, M. Guisnet, *Desilication of a TON zeolite with NaOH: Influence on porosity, acidity and catalytic properties*, Applied Catalysis A-General, Vol 399, 100-109, 2011

M. Guedes, J.M.F. Ferreira, L.A. Rocha, A.C. Ferro, *Vacuum infiltration of copper aluminate by liquid aluminium*, Ceramics International, Vol 37, 3631-3635, 2011

M.S. da Silva, R. Viveiros, M.B. Coelho, A. Aguiar-Ricardo, T. Casimiro, *Supercritical CO2-assisted preparation of a PMMA composite membrane for bisphenol A recognition in aqueous environment*, Chemical Engineering Science, Vol 68, 94-100, 2011

M.S. da Silva, R. Viveiros, P.I. Morgado, A. Aguiar-Ricardo, I.J. Correia, T. Casimiro, *Development of 2-(dimethylamino)ethyl methacrylate-based molecular recognition devices for controlled drug delivery using supercritical fluid technology*, International Journal of Pharmaceutics, Vol 416, 61-68, 2011

M. Temtem, T. Barroso, T. Casimiro, J.F. Mano, A. Aguiar-Ricardo, *Dual Stimuli Responsive Poly(N-isopropylacrylamide) Coated Chitosan Scaffolds for Controlled Release Prepared from a Non Residue Technology*, Journal of Supercritical Fluids in press, 2011

E. Costa, J. de Carvalho, T. Casimiro, C. Lobato da Silva, M.T. Cidade, A. Aguiar-Ricardo, *Tailoring thermoresponsive microbeads in supercritical carbon dioxide for biomedical applications*, Journal of Supercritical Fluids, Vol 56, 292-298, 2011

T. Barroso, M. Temtem, T. Casimiro, A. Aguiar-Ricardo, *Antifouling performance of poly(acrylonitrile)-based membranes: From green synthesis to application*, Journal of Supercritical Fluids, Vol 56, 312-321, 2011

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5. Other activities

The MicroLab organised a "Scanning Electron Microscopy Training Course" on the 8th of July of 2011 (leaflet available in Annex).

The course was divided in two sections:

- a theoretical introduction to scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS) and electron backscattered diffraction (EBSD), with a duration of 2h00. The lecturers were Professora Amélia Almeida and Professora Patrícia Carvalho.
- a practical session in the MicroLab using both the FEG-SEM JEOL JSM7001F and the SEM Hitachi S2400, with a duration of 4h00. The session was conducted by Professora Patrícia Carvalho and Engineer Isabel Nogueira.

The course had 6 attendants:

Name	Position	Institution
Mafalda Guedes	Assistant Professor	EST-IPS
Sofia Cardoso	PhD student	ISA
Armanda Amorim	Dentist	Rodrigues e Abreu, Consultores Médicos, Lda
Paula Albuquerque	Assistant Professor	ESTeSL
Jaime Puna	Trienial Assistant	ISEL
Carlos Simões	Trienial Assistant	ISEL

EST-IPS - Escola Superior de Tecnologia do Instituto Politécnico de Setúbal
ESTeSL - Escola Superior de Tecnologia da Saúde de Lisboa
ISA - Instituto Superior de Agronomia
ISEL - Instituto Superior de Engenharia de Lisboa

6. Analysis of activity progress with reference to planning, and strategies for improvement

During 2012 we have already scheduled for early February the installation of a new workstation for the analysis of EBSD patterns offline. This will allow the processing of EBSD results simultaneously with the use of the FEG-SEM JEOL JSM7001F with EDS or EBSD acquisition.

The main problem that the MicroLab faces is its aging equipment portfolio. We are planning to upgrade the image acquisition and EDS systems of the SEM Hitachi S2400, which have become obsolete and whose functionality and performance is no longer guaranteed by the manufacturer. It should be installed during the first semester of 2012.

The Ion Mill is still working and allows us to prepare samples for the TEM, but Gatan no longer provides spare parts for this instrument, making it extremely difficult to solve any problem we face during its use.

Another microscope whose performance we would like to improve is the TEM, through the acquisition of an electron diffraction precession system. This add-on decreases the dynamical behaviour of the electron diffraction, making space group identification much easier. However, funding for this system was not possible until now. We hope that during 2012 this situation may change.

In continuing the course organisation that we have began in 2011, the MicroLab will promote once again the one day “Scanning Electron Microscopy Training Course”.

The RNME-Seminar for network users will also take place, as a demonstration of our facilities for users of the other laboratories of the RNME.

Up until now the MicroLab has maintained its ability to serve a wide range of users by providing high quality electron microscopy services and techniques.

The smooth functioning of such a state-of-the-art facility has been possible not only due to the continuous joint effort of our team, but also to the timely payment of maintenance contracts that keep downtimes of all the equipment considerably low. This point cannot be overemphasized since it has been a key factor in the growth, building and maintaining the proper functioning of the MicroLab.

ANNEX

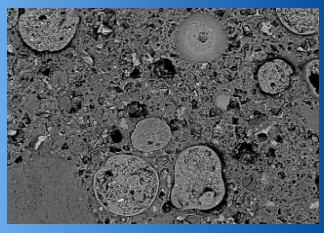
1. Leaflet of the “Scanning Electron Microscopy Training Course” that took place on the 8th of July of 2011 (mentioned in 5. Other activities):

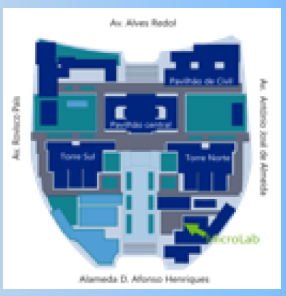
Acção de formação:

Microscopia Electrónica

para a

Indústria e Serviços





ORGANIZAÇÃO:

Eng. Isabel Nogueira
ICEMS/Instituto Superior Técnico

Prof. Rui Vilar
ICEMS/DEQB do Instituto Superior Técnico

APOIO:

MicroLab
Laboratório de Microscopia Electrónica

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Instituto Superior Técnico
Instituto de Ciência e Eng. de Materiais e Superfícies
Rede Nacional de Microscopia Electrónica

8 de Julho de 2011 – 9h00/18h00

Acção de formação:

Microscopia Electrónica

para a

Indústria e Serviços

Formadores:

Prof. Amélia Almeida
ICEMS/DEQB do Instituto Superior Técnico

Prof. Patrícia Carvalho
ICEMS/DEQB do Instituto Superior Técnico

Eng. Isabel Nogueira
ICEMS/Instituto Superior Técnico

Programa:

9h00/13h00

1. Preparação de amostras para microscopia electrónica de varrimento (SEM)

2. Informação obtida usando SEM:
• formação de imagem topográfica
• contraste de número atómico
• análise química elementar
• difracção de electrões

14h00/18h00

3. Sessão prática no microscópio electrónico de varrimento de alta resolução JEOL JSM7001F, com a possibilidade de observação de amostras trazidas pelos formandos (desde que entregues no MicroLab até ao dia 22/6)

Inscrição

Preencha o formulário seguinte ou envie correio electrónico com a informação pedida para isabel.nogueira@ist.utl.pt

Nome:
Empresa:
Cargo:
Endereço:
Telef.:
Email:

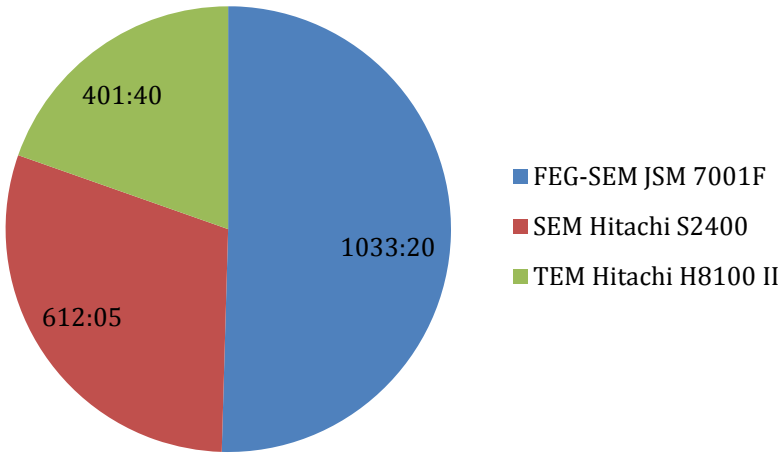
Jóia de inscrição: 150€

(inclui o almoço e um crédito de 1h30 de microscopia electrónica válido durante 6 meses após o curso)

Limite de inscrições: 8

2. Graphical information regarding the utilisation of the microscopes (as mentioned in 4.1 Electron Microscopy service activity).

The first chart shows the duration of use of each instrument in the MicroLab



On the 2nd chart we present the time distribution of each instrument's use according to the user affiliation.