

Activity Report 2010

MATGAS

TABLE OF CONTENT

1. Presentation

2. MATGAS

- Partners
- People at MATGAS
- MATGAS Laboratories

3. Research Activities

- Scientific Projects and Contracts
- MATGAS Conferences

4. Publications

- Publications and Patents
- Meetings and Conference Contributions

5. Students at MATGAS

6. In Memoriam





INTRODUCTION

MATGAS 2000 AIE, known as **MATGAS**, is a non-profit research organization, born ten years ago, as a joint venture among Carburos Metálicos-Air Products Group, the National Research Council of Spain (Consejo Superior de Investigaciones Científicas - CSIC) and the Autonomous University of Barcelona (Universitat Autònoma de Barcelona - UAB).

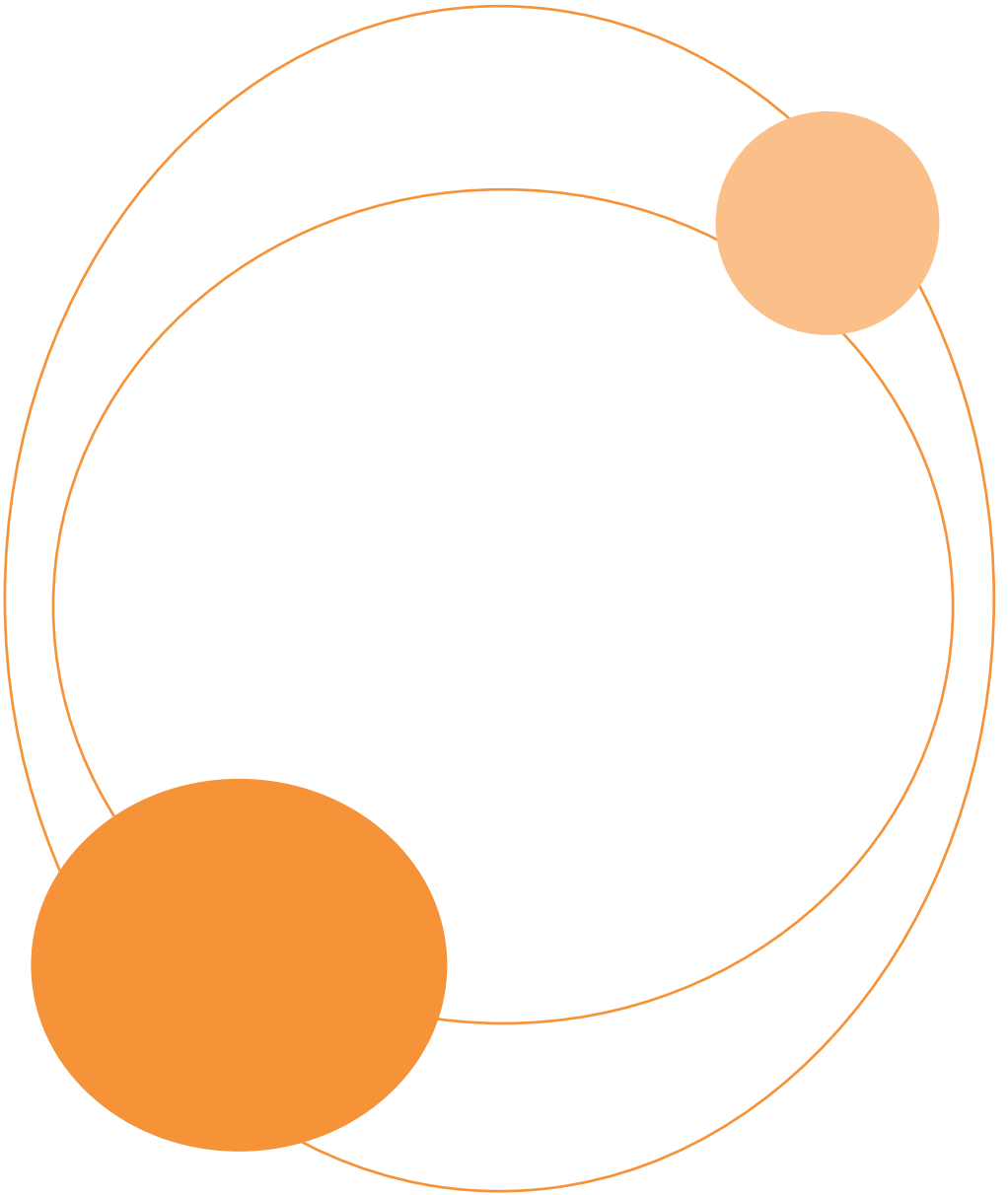
MATGAS was created to advance in the research and development of **MAT**erials and **GAS**es for different applications. The vision of **MATGAS** is to become a World-leading center of excellence that integrates research, technology development and demonstration in Energy, Sustainability and Environment, focused on greener energy solutions, including CO₂ capture and application, waste treatment and alternative energies, by combining modeling and experimental approaches. We will contribute to develop energy related new technologies friendly to the environment working in different angles of this complex problem, combining in a synergetic manner modeling with experiments. As part of the sustainability commitment we use Life Cycle Assessment tools to the new processes and products we develop. We do these developments in close contact with our strategic partners, with other researchers and with final users.

In summary, **MATGAS** provides an open framework and environment for creative discussions and advance of research in close contact with the industrial world. Between October 2009 and September 2010 our capabilities and results have been outstanding in the different areas we have been working, with projects related to CO₂ capture and applications, wastewater treatment, food preservation, hydrogen fuel cells and biomass; some new people have joined us, and several students from different universities have been working with us in different projects and areas. You will find some more details about our work in the coming pages.

I hope you'll enjoy this summary and find it helpful.

In Bellaterra October 1st 2010

Dr. Lourdes F. Vega
Director of **MATGAS**





MAT**G**AS

- **Partners**
- **People at MATGAS**
- **MATGAS Laboratories**



**CARBUROS
METALICOS**
Grupo Air Products

UAB
Universitat Autònoma
de Barcelona



CSIC

MAT GAS

THREE PARTNERS - ONE GOAL

Air Products is recognized for its innovative culture, operational excellence and commitment to safety and the environment.



Air Products Today: 18.900 employees around the world & Operations in more than 40 countries – 4 business areas: Merchant Gases, Tonnage Gases, Equipment and Energy, Electronics and Performance Materials.

<http://www.carbueros.com>
<http://www.airproducts.com>



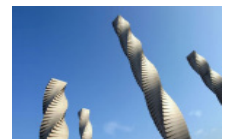
The Spanish National Research Council (CSIC, Consejo Superior de Investigaciones Científicas) is a public institution devoted to research present in all the Spanish Autonomous Communities with 126 centres and over 140 associated units with universities and other institutions.

<http://www.csic.es>

The Universitat Autònoma de Barcelona was founded in 1968 and promotes interactivity between the university and society as an important driving force for technological, educational and ideological progress.

The UAB is able to create important links with institutions and businesses through collaborative agreements, technology transfer, work-entry programmes, professional development and continuing education programmes.

<http://www.uab.cat>





MATGAS

From left to right:

Helena Lundquist, Raquel Ramírez, Elena López, Joaquím Torres, Joan Comas, Sonia Guri, Aurora Aguilera, Jaume Capell, Quim Guix, Patricio Martín, Oriol Ossó, Alicia Arce, Raúl Solanas, Emilio de la Serna, Javier Rodríguez-Viejo, Lourdes Vega, Oriol Vilaseca, Abel Roigé, Quim Salleras, Félix Llovell, Albert Moreno, Wounjim Chang, María Mercadé, Santiago Builes, Aida Al-Nehlawi, Pedro López-Aranguren

MATGAS Staff

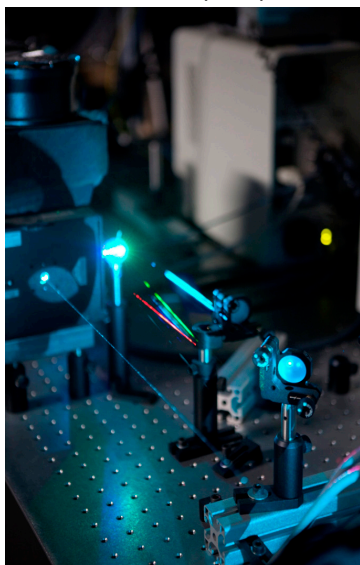
Director:	Lourdes Vega
Vice-directors:	Pedro Gómez-Romero Javier Rodríguez-Viejo
Executive Assistant:	Helena Lundquist
Administrative Manager:	Joan Comas
Project Managers:	Quim Salleras
Project Assistant:	Elena López María Mercadé
Technical Leads:	Sonia Guri Roberta Pacciani J. Oriol Ossó Joaquim Torres
Laboratory Technical Coordination:	Raquel Ramirez Javier Rubio
Post Doctoral Research Associates:	Raul Solanas Alicia Arce Óscar J. Prado
Research Assistant:	Aida Al-Nehlawi Gabriel Blejman Santiago Builes Wounjim Chang Pedro López-Aranguren Patricio Martín Abel Roigé Oriol Vilaseca
Technology Watch/web:	Jaume Capell
Support to projects/web:	Albert Moreno
Documentation and SAP:	Aurora Aguilera
Maintenacnce and workshop	Emili de la Serna
Reception and Maintenance	Xavier Calvo



MATGAS Laboratories

The research carried out at MATGAS is focused on CO₂ and other energy related issues, including hydrogen and alternative energies, with a special emphasis on sustainability. The MATGAS laboratories offer a variety of facilities that allow from the modeling and fabrication of new materials to their physical and chemical characterization, including the test for specific applications.

In the **Supercritical Fluids laboratory** research and development of new applications of supercritical fluids or fluids at high pressures and temperatures is carried out. This includes extraction and concentration of natural products, polymer impregnation, CO₂ transportation and sequestration and synthesis of new materials and catalysts. The laboratory is equipped with several high pressure reactors with different configurations and sizes, from 10ml to 16l; it also includes a pilot plant.



The **Nanotechnology laboratory** is a last generation lab equipped with the needed techniques for the characterization and manipulation of materials at nanoscale. The equipment includes SPM techniques (AFM and SNOM), particle size determination tools, micro-Raman scattering, nanocalorimetry, and nanoindentation. This laboratory allows a comprehensive study of the properties of nanostructured materials, including size, mechanical, thermal, optical,

structural, and electrical properties.

The **Gas Reactivity laboratory** is designed for the study of the reactivity and adsorption of a variety of gases into liquids or solids materials. This can be done by volumetric as well as gravimetric techniques and over a wide range of pressures and temperatures. Two magnetic microbalances with different configurations allow the gravimetric measurements under real conditions, with the



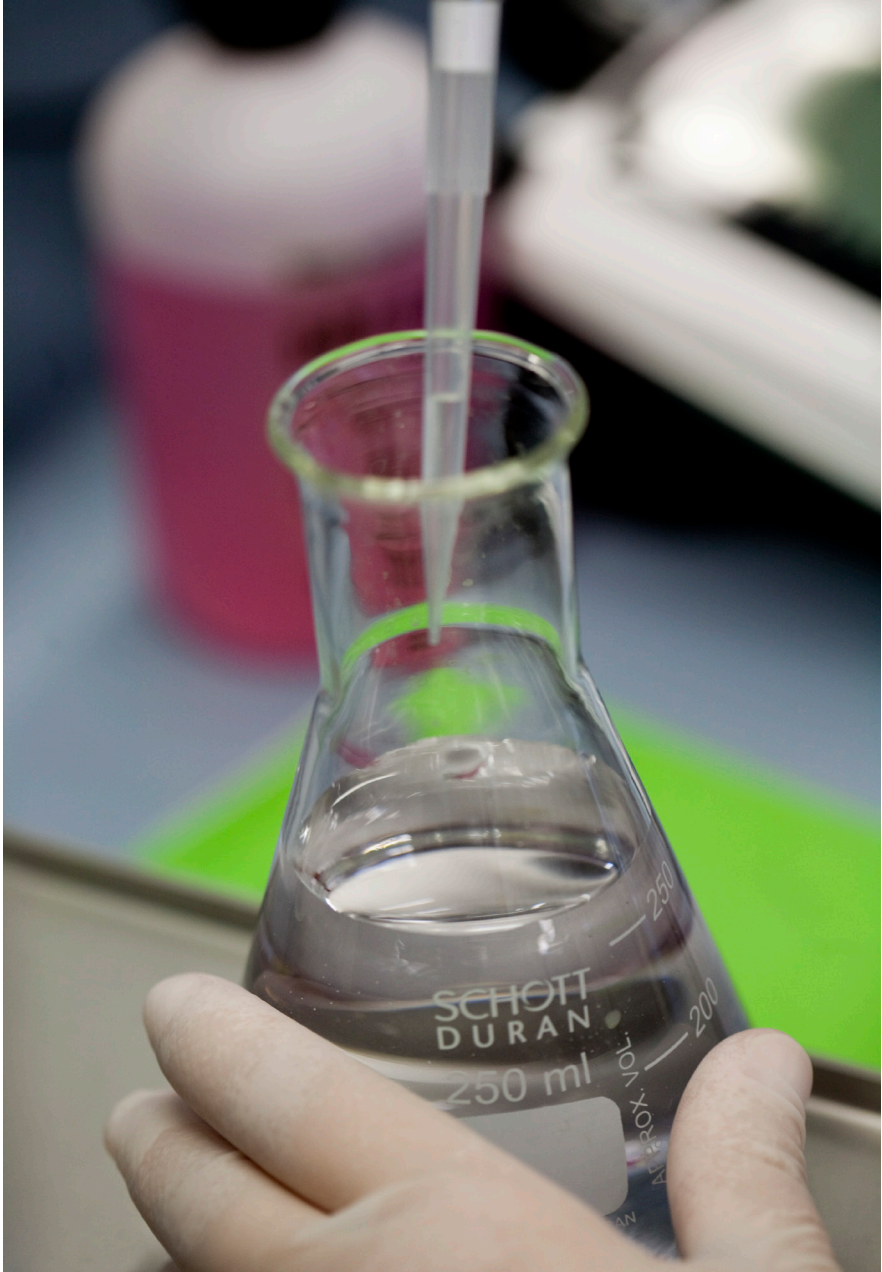
volumetric measurements are done with a BET equipment. This laboratory also includes equipment for the preparation of new materials for absorption of gases by sputtering in UHV and several potentiostats for electrochemical studies.

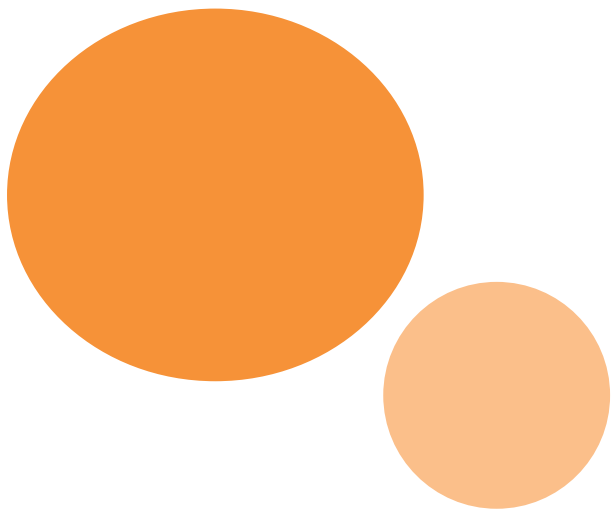
The **Computational Modeling laboratory** is a permanent calculation infrastructure to provide support to MATGAS projects

from a modeling perspective. Simulations performed in this lab help to obtain a deeper understanding of properties and processes at nanoscale and/or for different applications. Examples of recent projects include hydrogen storage in carbon nanostructures, deposition of copper layers as electrical contacts in microelectronics, the optimization of nanoparticle dispersions, the design and understanding of the behavior of materials for CO₂ capture and the behavior of selected ionic liquids.

The **Green Energy laboratory** offers facilities related to to the study of new sustainable energies. This includes a hydrogen fuel cell test bench, several potentiostats for electrochemical characterization, and different tools for the development of water treatment processes. Equipment for the development of new technologies in the fields of photovoltaics and bioenergy is planned to be located in this lab in the coming year







RESEARCH ACTIVITIES

- **Scientific Projects and Contracts**
- **MATGAS Conferences**
- **Publications and Patents**
- **Meetings and Conference Contributions**

SCIENTIFIC PROJECTS AND CONTRACTS



**SOST-CO2 –CENIT project, 4th General Assembly held in MATGAS
7 MAY 2010, Barcelona, Spain**



Acronym: SOST-CO₂ –CENIT project
Title: New industrial and sustainable uses of CO₂
Objectives: The main objective of the project is to develop CO₂ utilization technologies, complementary to capture technologies, as an alternative to the geological storage of CO₂. This project offers a clear environmental approach, since it will not only reduce CO₂ emissions but it also develops technologies for sustainable energy production (e.g. biofuels and hydrogen) and new uses of CO₂ for different applications.
PI: Dr. L. F. Vega
Budget: 26.3 Million euros.
Leader: Carbueros Metálicos, Air Products Group.
Consortium: 14 companies, 29 research centers
Status: Started in 2008, ending in 2011

MATGAS Three partners / Three different ways of participation:
 - CM/APCI: Leader of the Consortium
 - CSIC: 8 contracts in the consortium
 - UAB: 2 contracts in the consortium

MATGAS Leading the technical management part of the project

MATGAS Has been contracted by three other companies as a Research Center expert in CO₂ capture and applications

More details on the project can be found at: <http://www.cenit-sostco2.com/>

CONSORTIUM LED BY:





Acronym: BIOSOS –CENIT project
Title:
Objectives: To develop technology to design innovative and integrated biorefinery processes, combining energy production and bioproducts synthesis. Economic, environmental and social studies are also carried out for all the alternative processes to guarantee feasible and sustainable solutions.
Budget: 27 Million euros.
Leader: Abengoa Bioenergía Nuevas Tecnologías
Consortium: 14 companies
Status: Started in September 2009, ending in September 2012

The project is divided in five different activities: Raw Materials, Sugars, Gases, Bioproducts and Sustainability. Carburos Metálicos- Air Products is one of the partners in the project, while MATGAS and the other partners, CSIC and UAB participate as contractors to develop part of the technical work.

The project is developed by a significant consortium comprising 14 companies and 29 research centers. The consortium will unit efforts for four years.

CONSORTIUM LED BY: Abengoa Bioenergía Nuevas Tecnologías





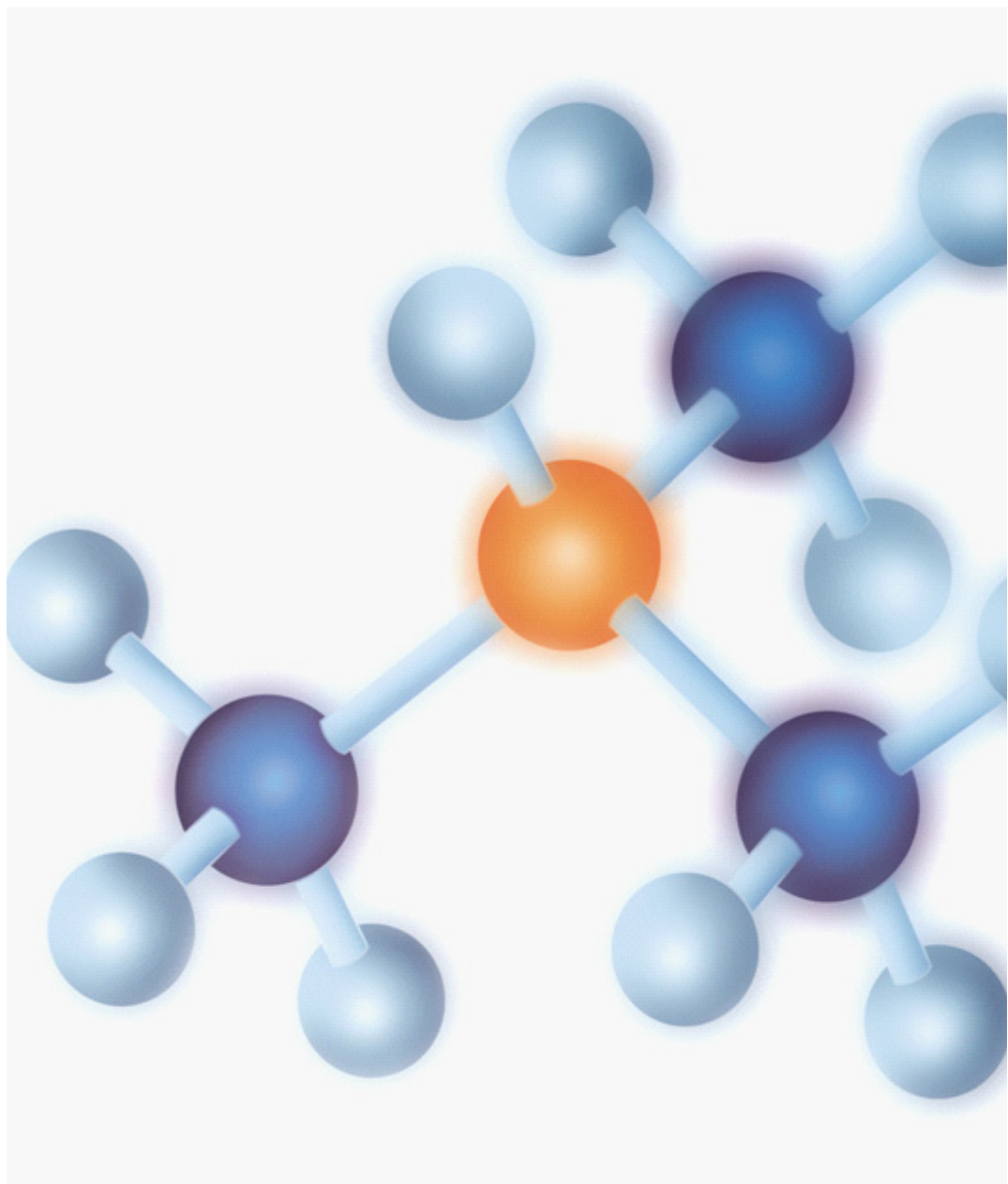
EC FUNDED PROJECTS



Acronym: COSY
Title: Complex Solid State Reactions for Energy Efficient Hydrogen Storage
Objectives: To reach a fundamental understanding of the sorption kinetics in Reactive Hydride Composites and related systems through three different strategies: empirical studies, model systems and a theoretical/modeling approach.



Acronym: LOLIPEM project
Title: Long-life PEM-FCH & CHP systems at temperatures ≥ 100 °C (LolIPEM).
Objectives: to give a clear demonstration that long-life SPG&CHP systems based on PEMFCHs working at temperatures ≥ 100 °C can be developed. This is achieved based on recent knowledge on the degradation mechanisms of membranes, disclosed by some participants in this project. In order to conciliate the achievement of the main objective with the need of durability, low cost, and an easy management, several sub-objectives have been defined, concerning development of stable and less expensive membranes, development of more stable catalytic electrodes as well as physico-chemical characterizations of the obtained products.
Coordinator: Dr. Giuseppe Barbieri, National Research Council - Institute on Membrane Technology, CNR-ITM.
Status: The kick-off meeting was held on 17-18 February in Rome. A second meeting was organized on 27 May in Cetraro, Italy. The task where MATGAS is involved started in July, and since then we have been working with the partners to establish a protocol for the testing of the membranes. Dr. Alicia Arce was hired by MATGAS to conduct part of the work and to give her expertise on this area.





SPANISH GOVERNMENT FUNDED PROJECTS

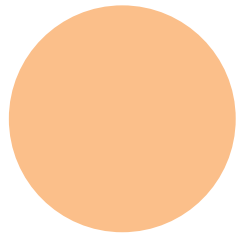
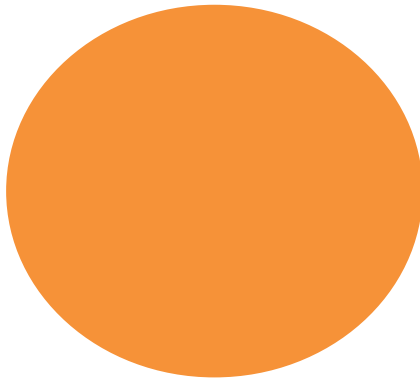
Acronym: CIUDEN project
Title: Experimental characterization of scCO₂ injection into storage materials located in Hontomín (Burgos), where the Geologic Sequestration Development Plant will be built.
Objectives: To get detailed information of the reaction of CO₂ with rocks under sequestration conditions, using the supercritical lab facilities and know-how
PI: L. F. Vega
Budget: 100.000€

Acronym: ENAPROMAT
Title: Diseño racional de procesos y materiales para aplicaciones en energía y nanotecnología
Objectives: The systematic improvement of selected processes and materials, related to energy and nanotechnology, by a combination of molecular modeling techniques with advanced experimental techniques. The three particular objectives are: 1) the use of alternative solvents for different applications, including ionic liquid and supercritical fluids, 2) systematic search for new adsorbents for selective separation, with special emphasis on CO₂ and other greenhouse gases and 3) design, characterization and applications of nanoparticles and other materials for different industrial applications.
PI: L.F. Vega

Acronym: NOMOCELL
Title: Nanostructured organic materials for highly efficient plastic solar cell applications
Objectives: Further enhance the efficiency of plastic solar cells towards 10%-15%, the predicted range for economically viable market uptake of this technology.
PI: M. Campoy (CSIC)
MATGAS
Member: J. O. Ossó

Title: Photocatalytic Reactors for CO₂ reduction
Objectives: Design, construction, and modeling of photocatalytic reactors for CO₂ reduction for the production of syngas and other added-value products. The project combines management tasks with R&D activities to design photocatalytic reactors for CO₂ reduction.
Investigator: Dr. I. Salvadó

Acronym: **Torres Quevedo awards**
Title: Applications and control of gases in the food industry
Objectives: Coordination of different research projects related to the application of gases in the food industrial sector. The projects will be in the areas of (a) Modified Atmosphere Packaging (MAP), (b) CO₂ utilization for desinsectation, (c) aromatic compounds detection in CO₂, and (d) development of microsenors for wine analysis.
Investigator: S. Guri





Title: Consolidated Group from the Generalitat of Catalonia
2009 SGR 666

Objectives: To support the research carried out by quality groups, as approved by the Catalan Government

PI: L. F. Vega

Members: C. Domingo (CSIC), R. M. Marcos (URV), F. Llovell (CSIC), S. Builes (MATGAS), P. Lópex-Aranguren (CSIC-MATGAS), C. Herdes (U. Évora), J. Pámies (U. Columbia), A. López-Peraggio (ICMAB-CSIC), O. Vilaseca (MATGAS-CSIC)

Acronym: Talent Empresa (TEM 2009) Awards

A -Type (Pre-doc): Mr. Santiago Builes: A combined modelling-experimental approach to speed up the development of materials for CO₂ capture and utilization

B -Type (Post-doc): Dr. Raquel Ramírez: Design and optimization of new materials for CO₂ Capture



Acronym: ICREA JE (Junior Enterprise)

Title: Organic semiconductors for photovoltaic applications

Objectives: Improve organic cells efficiency by controlling their structure and morphology at the nanometer scale.

Investigator: Dr. J. Oriol Ossó

Collaborators: F. Schreiber (U. Tübingen), E. Barrena (Max-Planck-Institut für Metallforschung, Stuttgart), H. Dosch (Max-Planck-Institut für Metallforschung, Stuttgart) and J. Puigdollers (Universitat Politècnica de Catalunya, Barcelona).





Title: Acidification of water effluents from power plants refrigeration systems through CO₂.

Objective: Physico - chemical characterization of water

IP: S. Guri

Members: L. Vega, E. Rodriguez (Iberdrola), J. Lafuente (UAB) and O. Prado

Company: Iberdrola

Starting date: 01/OCT/08

Duration: 3 years



Title: CO₂ enriched atmospheres for poultry packaging.

Objective: Evaluate the different CO₂ concentration on microbiological and physico-chemical properties of poultry meat.

IP: S. Guri (CM-APCI)

Members: L. F. Vega, A. Al-Nehlawi, A. Corujo (Nutreco) and C. Martin (Nutreco)

Company: Nutreco

Starting date: 01/JAN/08

Duration: 3.5 years



Title: Design & Assembly of a demonstration unit to blend and inject CO₂ at high pressure.

Objective: Design a demo unit for expanding new polymers by CO₂ injection.

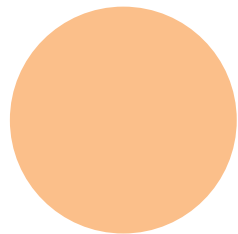
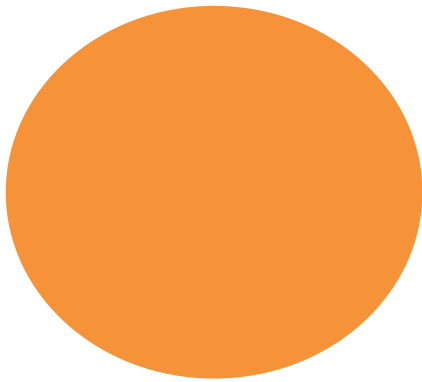
IP: J. Torres

Members: J. Fauquier, M. Gómez, E. Cuesta (LINPAC).

Company: LINPAC

Starting date: 01/JAN/08

Duration: 2 years



SEMINAR SERIES ON CO₂ AND SUSTAINABILITY

The objective of this series of seminars is to acquire and divulgate a solid knowledge of the state of the art in the field of CO₂ capture, utilization and energy issues associated to environmentally benign energy technology and sustainability.

Several international experts on CO₂ capture, sequestration, utilization and energy connected issues (including hydrogen) have been and will be invited to participate in this series. Their expertise gives a broad perspective to the subject: from fundamental knowledge to well-developed technologies. The complementary approach enlightens the issues and challenges on this relevant topic.



Prof. Ricard GARCIA-VALLS

Director of the School of Chemical Engineering - University Rovira i Virgili (URV).
Tarragona. Spain

«The art of membranes»

18 NOVEMBER 2009



Dr. Juan Carlos ABANADES

Senior Researcher, Instituto Nacional del Carbón. Consejo Superior de Investigaciones Científicas (INCAR – CSIC), Oviedo, Asturias, Spain

«Calcium looping for CO₂ capture»

16 DECEMBER 2009



Prof. Rosa PALACÍN

Researcher at ICMAB (Institut de Ciència de Materials. Bellaterra. Spain

«Batteries as Energy Storage Devices: Concepts, Applications and State of the Art»

26 FEBRUARY 2010



Dr. Roger GADIOU

Assistant Professor, Université de Haute Alsace, Researcher at Institut de Science des Matériaux, Mulhouse, France

«Nanostructured Carbon and Hybrid Materials: Synthesis, Characterization and Performances in Energy and Environmental Applications»

16 MARCH 2010



Prof. Andrés PÉREZ-ESTAÚN

Research Professor, CSIC, Director of the Programme Geological CO₂ Storage, CIUDEN, Spain

«The CO₂ Geological Storage Programme of the Foundation “Ciudad de la Energía” »

25 MARCH 2010



Dr. Gara VILLALBA

Associate Professor, Autonomous University of Barcelona, Chemical Engineering Department, Spain

«Greenhouse Gases at the City Level»

11 MAY 2010



Prof. Pedro Gómez-Romero

Research Professor, CIN2, Center of Investigation for Nanoscience and Nanotechnology, Spain

«From Nanometers to Terawatts; Pending Revolutions in Material Science»

30 JUNE 2010



Dr. Andreas PODIAS

Researcher, Laboratory of Alternative Energy Conversion Systems, University of Thessaly, Volos, Greece

«Performance testing, modeling & simulation in PEM fuel cells»

1 SEPTEMBER 2010



Dr. Niall MAC DOWELL

Research Associate, Department of Chemical Engineering, Imperial College, UK

«Integrated solvent and process design for CO₂ capture processes»

17 SEPTEMBER 2010



Dr. Josep PÀMIÉS

Associate Editor, NATURE MATERIALS, Spain

«Appealing to Nature Materials. An editor's view»

22 SEPTEMBER 2010



Prof. Francisco CUADROS

Full Professor in Applied Physics, University of Extremadura, Spain

«Project BIOGASOL. Hybridization of biogas and concentration of thermal solar energy»

23 SEPTEMBER 2010



Prof. Bruce LOGAN

Kappe Professor of Environmental Engineering, Director of the Engineering Energy & Environmental Institute (E3I), Penn State University, USA

«Bioelectrochemical hydrogen gas production using microbial electrolysis cells»

28 SEPTEMBER 2010

OTHER TECHNICAL EVENTS HELD IN MATGAS

SYMPOSIA:

«SUSTAINABLE DEVELOPMENT OF NEW INDUSTRIAL PROCESSES THROUGH LIFE CYCLE ANALYSIS».

Chair persons: R. Pacciani and L.F. Vega, organized by MATGAS. More than 60 participants from industry and academia from different parts of Spain attended the symposium at MATGAS.

Additional information can be found at:

<http://www.matgas.com/other-internal-seminars/153-sustainable-development-of-new-industrial-processes-through-life-cycle-analysis>

Date: 20 May, 2010

«20 YEARS OF THE SAFT EQUATION: RECENT ADVANCES AND CHALLENGES»,
Chair-persons L.F. Vega (MATGAS) and G. Jackson (Imperial College).

Co-organized by MATGAS and ICMAB-CSIC.

More than 70 participants from Europe, USA, Canada, South America, Asia and Africa attended the event, held in MATGAS.

Additional information can be found at:

<http://www.matgas.com/saft2010/>

Desarrollo sostenible de
nuevos procesos
industriales a través del
Análisis de Ciclo de Vida.

SPRIMO



MATGAS 2007-2010 (Año Internacional de Innovación)
del 6 de mayo de 2010.
BITEPS



COURSES.

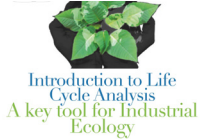
«Life Cycle Analysis Introduction»

Course organized by MATGAS and the Autonomous University of Barcelona, offered to master students and industrial researchers interested in the field, 22,5 hours

Directors: Prof. Javier Rodríguez-Viejo and Dr. Roberta Pacciani

Lecturers: experts in the field from MATGAS, UAB and other institutions

Dates: from 12 April until 20 May 2010



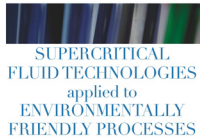
«Application of Supercritical Fluids to environmental benign processes and products»

Course organized by MATGAS and the Autonomous University of Barcelona, offered to master students and industrial researchers interested in the field, 22,5 hours.

Directors: Prof. Javier Rodríguez-Viejo and Mr. Raúl Solanas

Lecturers: experts in the field from MATGAS, UAB and other institutions.

Dates: from 14 April until 26 May 2010



OTHER TECHNICAL EVENTS HELD IN MATGAS

3rd Technical Food Meeting, a conference about MAP, in the frame of Innovation for Food Industry Conference, organized by the Carburios business team in collaboration with R&D in MATGAS. The panel of experts included people from academy and business, as well as technical people from the Catalan and Spanish Government.

The event had more than 40 attendees.

26 NOVEMBER 2009



Left to right: G. García-Guereta (CM), L. Vega (CM-Matgas), C. Peña (ACC1Ó), M. Mena (CM), S. Gruí (CM-Matgas), C Esquiús (CM), J.L. Calvo (CM), L. Arranz (AFEPADI), M.P. Sanz (CDTI)

3rd General Assembly of the SOST-CO2 project.

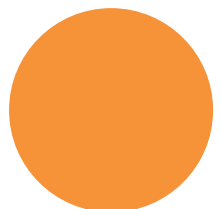
A meeting was held at MATGAS gathering 60 participants from the partners and collaborators of the CENIT “New Industrial and Sustainable Uses of CO₂ – SOST-CO2” and representatives from CDTI. Besides the technical presentations on the advancement of the project three companies, Abengoa Bioenergy, Amphos21 and BiogasFuelCell, presented the overall strategy of their company, searching for synergies for further collaborations in the future

20 NOVEMBER 2009, Barcelona, Spain

4th General Assembly of the SOST-CO2 project.

A meeting was held at MATGAS gathering 60 participants from the partners and collaborators of the CENIT “New Industrial and Sustainable Uses of CO₂ – SOST-CO2” and representatives from CDTI. The main purpose of the meeting was to give an update on the main achievements obtained in 2009 and to revise the goals for the next year.

7 MAY 2010, Barcelona, Spain



PUBLICATIONS

- **Publications and Patents**
- **Meetings and Conference Contributions**



Presentation of the book “CO₂ as a resource: from capture to industrial applications” held in Barcelona on 22 June at the headquarters of Gas Natural.

PUBLICATIONS

BOOKS (OCTOBER 2009 – SEPTEMBER 2010)



ISBN: 978-84-614-1195-5

Dr. L.F. Vega presented the book entitled “CO₂ as a resource: from capture to industrial applications” – (“El CO₂ como recurso: de la captura a los usos industriales”), authored by herself, in the seminar “CO₂ as a resource – from capture to industrial uses”, organized by Fundación Gas Natural.
22 JUNE, 2010

Book chapter:

L.F. Vega: “Sustainability and efficiency of the new technologies for CO₂ capture, transformation and utilization: advantages and challenges”. Chapter 10 in the book entitled: “The energetic sector facing a new scenario”, published by Thomson Reuters. National Commission of Energy of Spain, June 2010.

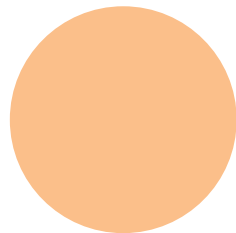
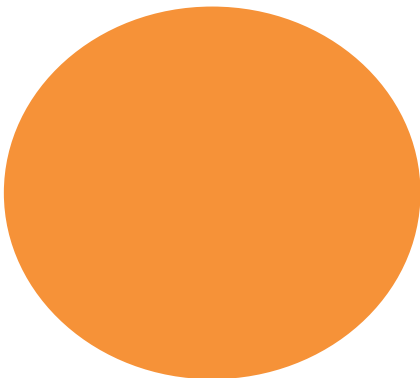
ARTICLES IN JOURNALS

- 1.- *Investigation of the Enhanced Water Gas Shift Reaction Using Natural and Synthetic Sorbents for the Capture of CO₂*
L. F. Vega, F. Llovell and F. J. Blas
Industrial & Engineering Chemistry Research, 48 (23) pp. 10284-10291 (2009)
- 2.- *Soft-SAFT modeling of vapor–liquid equilibria of nitriles and their mixtures*
A. Belkadi, M.K. HadjKali, F. Llovell, V. Gerbaud, L.F. Vega;
Fluid Phase Equilibria, vol. 289, pp. 191–200 (2010)
- 3.- *Thermodynamic characterization of pure perfluoroalkanes, including interfacial and second order derivative properties, using the crossover soft-SAFT EoS*
A. M. A. Dias, F. Llovell, J. A. P. Coutinho, I. M. Marrucho, L. F. Vega;
Fluid Phase Equilibria, vol. 286 (2), pp. 134-143 (2009)
- 4.- *Evaluation of the liquid–solid interfacial energy from crystallization kinetic data*
J. Torrens- Serra, S. Roth, J. Rodríguez-Viejo, M.T. Clavaguera-Mora
Scripta Mater, vol. 61 (9), pp. 879-882 (2009)
- 5.- *Ultra-Low Thermal Conductivity in Nanoscale Layered Oxides*
J. Alvarez-Quintana, L. Peralba-Garcia, J.L. Labar, J. Rodriguez-Viejo
J. of Heat Transfer – Transactions, vol. 132, pp. 032402 (2010)
- 6.- *Size effects and extraordinary stability of ultrathin vapor deposited glassy films of toluene*
E. Leon-Gutierrez, G. Garcia, M. T. Clavaguera-Mora, J. Rodríguez-Viejo
J. Phys. Chem. Letters 1(1), 341-345 (2010)
- 7.- *Analytical expression for thermal conductivity of superlattices*
F. X. Alvarez, J. Alvarez-Quintana, D. Jou, J. Rodriguez Viejo
Journal of Applied Physics, vol. 107(8), pp. 084303/1-084303/8, (2010)
- 8.- *Effect of minor Co additions on the crystallization and magnetic properties of Fe(Co)NbBCu alloys*
J. Torrens-Serra, P. Bruna, S. Roth, J. Rodríguez-Viejo, M. T. Clavaguera-Mora
Journal of Alloys and Compounds, vol. 496(1-2), pp. 202-207 (2010)

- 9.- *Temperature dependent thermal conductivity of polycrystalline ZnO films*
J. Alvarez-Quintana, E. Martinez, E. Perez-Tijerina, S. Perez-Garcia, J. Rodriguez-Viejo
Journal of Applied Physics, vol. **107(6)**, pp. **063713/1-063713/4**, (2010)
- 10.- *Crystal Grain Orientation in Organic Homo- and Heteroepitaxy of Pentacene and Perfluoropentacene Studied with X-ray Spectromicroscopy*
S. Kowarik, K. Broch, A. Hinderhofer, A. Schwartzberg, J. O. Ossó, D. Kilcoyne, F. Schreiber, S.R. Leone
Journal of Physical Chemistry C **114**, **30** (2010)
- 11.- *Modeling ionic liquids and the solubility of gases in them: Recent advances and perspectives*
L.F. Vega, O. Vilaseca, F. Llovel and J. S. Andreu
Fluid Phase Equilibria **294(1-2)**, **15 - 30** (2010)
- 12.- *Stability of thin film glasses of toluene and ethylbenzene formed by vapor deposition: an in situ nanocalometric study*
E. Leon-Gutierrez, A. Sepúlveda, G. Garcia, M. T. Clavaguera-Mora, J. Rodríguez-Viejo
Phys. Chem. Chem. Phys. **12**, **14693-14698** (2010)
- 13.- *A breakthrough technique for the preparation of high-yield precipitated calcium carbonate*
A. M. López-Periogo, R. Pacciani, C. García-González, L. F. Vega, C. Domingo
The Journal of Supercritical Fluids **52**, **298-305** (2010)
- 14.- *Effect of minor additions on the glass forming ability and magnetic properties of Fe-Nb-B based metallic glasses*
J. Torrens-Serra, P. Bruna, S. Roth, J. Rodríguez-Viejo, M.T. Clavaguera-Mora
Intermetallics **18**, **773-780** (2010)
- 15.- *Direct calculation of interfacial properties of fluids close to the critical region by a molecular-based equation of state*
O. Vilaseca, L.F. Vega
Fluid Phase Equilibria, doi:10.1016/j.fluid.2010.09.018. In press

PATENTS

Title: *Process for eradication of pests in an agricultural product*
Inventor: J. Riudavets, C. Castañé, C. Alomar, S. Guri, J. Sánchez
Applicant: S.E. de Carburos Metálicos, SA
Number: (EP08382036.5) - European Patent
Year: 2008



MEETINGS AND CONFERENCE CONTRIBUTIONS

OUTSIDE INVITED TALKS

1. «MATGAS – an example of private-public collaboration – synergies to faster develop technology»

L.F.Vega, S. Guri

Presentation at the annual meeting of the Packaged Gases team in Southern Europe, Air Products.

11 November 2009

2. «Alternativas al confinamiento: valorización del CO₂». (“Alternatives to the sequestration: valorization of CO₂”)

L.F.Vega.

Workshop on «Following up of the Copenhagen Meeting on Capture and Sequestration of CO₂». Organized by Intereconomía Conferencias.

26 January 2010, Madrid, Spain,

3. «The challenge of finding new industrial applications for CO₂».

L.F.Vega.

Industrial Session at the IV Meeting of Experts on High Pressure Supercritical Fluids Technology (FLUCOMP 2010).

12 February 2010, Ciudad Real (Spain)

4. «Presentation of the event and an Introduction to the SOST-CO₂ Programme»

L.F. Vega

4th Technical Day of innovation and tendencies in the food industry organized by Carbueros Metálicos

24 February 2010, Seville (Spain).

5. «Gases for the Food Industry: Packaging and residual Waste Treatment»

S. Guri

4th Technical Day of innovation and tendencies in the food industry organized by Carbueros Metálicos

24 February 2010, Seville (Spain).

6. «Measuring the uptake of CO₂ by Lithium Orthosilicate under realistic flue-gas conditions».

R. Pacciani, J. Torres, P. Solsona, B. Quinn, J. Hufton, T. Golden, C. Coe, M. Himada, C. Kimura, L. F. Vega

Conference paper presented at the conference i-SUP 2010.

7. «The utilization of gases in water and sludge treatment»

S. Guri

Technical Day organized by Gasin-Carbueros Metálicos

12 May 2010, Porto (Portugal).

8. «Advantages of using thermocalorimetry at extreme temperatura and pressure conditions».

R. Pacciani

Theory and hands on training on TGA-SDT, DVS Y TGA-HP, TGA-SDT, DVS Y TGA-HP.

27 May 2010, TA Instruments (Cerdanyola del Valles).

9. «Catalan Women in Science»

L.F. Vega

Opening Day of the itinerant exposition opened on 23 February in Barcelona that will be held in different places in Spain

7 June 2010, Tarragona (Spain).

10. «Using CO₂ at large scale: oportunities and challenges»

L.F. Vega

XXII Sitges Conference on Statistical Mechanics

7-11 June 2010, Sitges (Spain)

11. «Theoretical modeling of Ionic liquids: a statistical mechanics approach»

L. F. Vega

Fourth Summer School in Theoretical and Computational Chemistry of Catalonia.

14-18 June, Barcelona (Spain).

12. «Pushing the SAFT approach forward: soft-SAFT and its Extensions»

L.F Vega

20 Years of the SAFT Equation: recent Advances and Challenges

19-21 September, Bellaterra (Spain)

ORAL PRESENTATIONS IN SCIENTIFIC CONFERENCES

13. «Packaging and gases: Gas mixtures for food packaging»

S. Guri

Course of Packaging and shelf-life. Área de Formación de Mercabarna. Organized by UAB-Mercabarna.

28 October 2009, Barcelona (Spain).

14. «Capturing the Solubility Minima of Hydrocarbons in Water by the soft-SAFT Equation of State»

L.F. Vega, F. Llovell, F. J. Blas

EQUIFASE 2009

17-21 October 2009, Praia da Rocha, Algarve (Portugal)

15. «MAP applications»

S. Guri

Workshop research-industry. R+D+I applications to food sector and related areas. Organized by Nodus Barberà and Acc1Ó.

3 November 2009, Polinyà (Spain).

16. «Last developments in MAP»

S. Guri

1st Seminar AIMPLAS: New developments on plastics materials for packages and packaging systems. Organized by AIMPLAS.

3-4 November 2009, Valencia (Spain).

17. «Gases application to food industry: MAP for food preservation»

S. Guri

3rd Congress on Food Engineering and Biology. Organized by CRESCA.

24-25 November 2009, Terrassa (Spain).

18. «Direct imaging of the visible emission bands from individual ZnO nanowires by near-field optical spectroscopy»

F. Güell, J.O. Ossó, A.R. Goñi, A. Cornet and J.R. Morante.

2010 Material Research Society Fall Meeting.

30 November 30 – 2 December 2009, Boston (USA)

19. «A novel technique for the production of Precipitated Calcium Carbonate»
R. Pacciani, A.M. López Periago, C. García-González, C. Domingo, L. F. Vega.
IV Meeting of Experts on High Pressure Supercritical Fluids Technology (FLUCOMP 2010)
10-12 February 2010, Ciudad Real (Spain)
20. «Observation of wave-guiding effects in ZnO nanowires by SNOM»
F. Güell, J. O. Ossó, A. R. Goñi, A. Cornet, J. R. Morante.
16th International Winterschool on New Developments in Solid State Physics: Low Dimensional Systems.
22-26 February 2010, Mauterndorf (Austria)
21. «Coupling effects in heterostructures of Pentacene and perfluorinated Pentacene studied by optical spectroscopy»
K. Broch, U. Heinemeyer, A. Hinderhofer, F. Anger, J. O. Ossó, R. Scholz, A. Gerlach, F. Schreiber
DPG Frühjahrstagung 2010
21-26 March 2010, Regensburg (Germany)
22. «Refined determination of anisotropic dielectric tensor of β -PTCDA in the visible»
M. I. Alonso, M. Garriga, J. O. Ossó, F. Schreiber, L. Gisslen, R. Scholz
DPG Frühjahrstagung 2010
21-26 March 2010, Regensburg (Germany)
23. «New approach for the preparation of precipitated calcium carbonate in supercritical CO₂»
A López-Periago, R. Pacciani, C. Garcia González, L.F. Vega,
II Iberoamerican Conference on Supercritical Fluids
5-9 April 2010 (Brasil)
24. «Feasibility of some commercial biodegradables films for modified atmosphere packaging of red meat»
S. Guri, G. Coelho
5th Central European Congress on Food
19-22 May 2010, Bratislava (Slovakia)

25. «Activities related to Life Cycle Analysis Tools in MATGAS»
R. Pacciani
Sustainable development of new industrial processes through the use of Life Cycle Analysis tools.
20 May 2010, MATGAS (Bellaterra).
26. «Sustainable development of new industrial processes»
L.F. Vega
Sustainable development of new industrial processes through the use of Life Cycle Analysis tools.
20 May 2010, MATGAS (Bellaterra).
27. «A statistical mechanics based equation of state for thermodynamic predictions: soft-SAFT»
F. Llovell, O. Vilaseca, R.M. Marcos, L.F. Vega
XXVI Reunio de la Xarxa de Quimica Teorica i Computacional de Catalunya
12-13 July 2010, Barcelona (Spain)
28. «Atomistic Self-Assembly of Nano-Objects on Large Scale»
T. Roussel, L.F. Vega
XXVI Reunio de la Xarxa de Quimica Teorica i Computacional de Catalunya
12-13 July 2010, Barcelona (Spain)
29. «Adsorption of CO₂ Using Zeolite Templated Carbons»
S. Builes, T. Roussel, C. Ghimbeu, J. Parmentier, R. Gadiou, C. Vix-Guterl, L.F. Vega
Computational Carbon Capture
26-28 July 2010, CECAM-HQ-EPFL, Lausanne (Switzerland)
30. «Thermodynamic characterization of ionic liquids and their mixtures with supercritical carbon dioxide»
E. Valente, O. Vilaseca, F. Llovell, R. M. Marcos, L.F. Vega
9th Conference on Supercritical Fluids and Their Applications
5-8 September, Sorrento (Italy)
31. «Adsorbent materials for CO₂ capture synthesized from SCCO₂: calcium carbonate and supported amines»
C. Domingo, A.M. López Periago, R. Pacciani, A. Hidalgo-López, P. López-Aranguren, L.F. Vega
9th Conference on Supercritical Fluids and Their Applications
5-8 September, Sorrento (Italy)

POSTER PRESENTATIONS IN SCIENTIFIC CONFERENCES

32. «Thermodynamic Characterization of Perfluoroalkanes and their Mixtures with CO₂ with the Generalized soft-SAFT EoS»

F. Lovell, A.M.A. Dias, J.A.P. Coutinho, I.M. Marrucho, L.F. Vega.

EQUIFASE 2009

17-21 October 2009, Praia da Rocha, Algarve (Portugal)

33. «Development of a laboratory procedure for obtaining the microexpansion capacity of films and polymeric laminates with high pressure»

R. Solanas, J. Torres, L. F. Vega.

IV Meeting of Experts on High Pressure Supercritical Fluids Technology (FLUCOMP 2010)

10-12 February 2010, Ciudad Real (Spain)

34. «Water treatments: an environmental and energy integration opportunity»

S. Guri, C.Pallé, R. Eppler, A. Weist, L.F. Vega

Opportunities networking poster session

3 March, 2010, Trexlertown (USA)

35. « In-situ AFM study of P3HT: PCBM mixtures during thermal annealing»

A. Roigé, J. O. Ossó, M. Schmidt, M. Campoy-Quiles, L. F. Vega

DPG Frühjahrstagung 2010

21-26 March 2010, Regensburg (Germany)

36. «Photoluminescence in coevaporated pentacene- perfluoropentacene films»

F. Anger, J. O. Ossó, U. Heinemeyer, K. Broch, R. Scholz, A. Gerlach, F.

Schreiber

DPG Frühjahrstagung 2010

21-26 March 2010, Regensburg (Germany)

37. «Improving sustainability for growth: using the right tools»

Listemann, R. Pacciani, J. Cirucci and L.F. Vega.

Growth Opportunity Conference Poster Session

22 April, 2010, Trexlertown (USA)

38. «Optimization of morphology and geometry of organic solar cells»
A.Roigé, M.Schmidt, V.Andersson, W.Li, C.Muller, K.Tvingstedt, I.Alonso,
A.R.Goñi, F.Zhang, M.Garriga, J.O.Ossó, Z.Bo, O.Inganäs and M.Campoy-Quiles
International Workshop on Molecular Materials
2-5 May 2010, Sanxenxo (Spain)
39. «Argon as an innovative gas packaging for tuna fillets in modified atmosphere»
S. Pareda, S. Guri
XIII Food Studies Meeting on Health and Chemistry: Focus on Food Innovation
11-12 May 2010, Barcelona (Spain)
40. «Dissolution of CO₂ in poultry pieces packaged under high CO₂ modified atmosphere»
A. Al-Nehlawi, S. Guri
5th Central European Congress on Food
19-22 May 2010, Bratislava (Slovakia)
41. «Real time studies during coating and post deposition annealing in organic semiconductors»
M. Schmidt, A. Roigé, T. A. M. Ferenczi, D. Nassyrov, O. Peña, J. O. Ossó, D. D. C. Bradley, J. Nelson, A. R. Goñi, M. I. Alonso, P. G. Etchegoin, M. Garriga and M. Campoy-Quiles
5th International Conference on Spectroscopic Ellipsometry
23-28 May 2010, Albany, NY (USA)
42. «Study and nanoscale morphology optimization of P3HT: PCBM thin films for organic solar cells»
A. Roigé, J.O. Ossó, M. Schmidt, M. Campoy-Quiles and L. F. Vega
IV Jornada AIN (Aplicaciones Industriales de la Nanotecnología)
9-10 June 2010, Barcelona (Spain)
43. «The use of Carbon Dioxide in big bags and containers for the control of pests in food products»
Pons, M.J., García Cámara, A., Guri, S. and Riudavets, J.
10th International Working Conference on Stored Product Protection.
27 June – 2 July, 2010 Estoril (Portugal)

44. «Self-Assembly of Nano-Objects onto Surfaces (SANOs): a 2D Grand Canonical Monte-Carlo approach»
T. Roussel, L. F. Vega
II International Soft Matter Conference 2010
Dates and place: 5-8 July 2010, Granada (Spain)
45. «Prediction of interfacial properties: a comparison of theoretical approaches with experimental data»
L. F. Vega, O. Vilaseca, R.M. Marcos
II International Soft Matter Conference 2010
5-8 July 2010, Granada (Spain)
46. «Investigation of CO₂ photoreduction via transient absorption measurements»
C. Roscini, J. Hernando, J. O. Ossó, J. L. Bourdelande y L. F. Vega
IUPAC Symposium on Photochemistry
11-16 July 2010, Ferrara (Italy)
47. « Impregnation of porous substrates with alkyl- and amino-silanes using supercritical fluid technology»
P. López-Aranguren, C.A. García González, L.F. Vega, C. Domingo
9th Conference on Supercritical Fluids and Their Applications
5-8 September, Sorrento (Italy)
48. «Recent advances in the modeling of complex mixtures of ionic liquids with soft-SAFT combined with Density Gradient Theory»
E. Valente, F. Llovel, O. Vilaseca, R.M. Marcos, L.F. Vega
20 Years of the SAFT Equation: recent Advances and Challenges
19-21 September, Bellaterra (Spain)
49. «Critical, interfacial and surface properties of ionic liquids using soft-SAFT combined with Density Gradient Theory»
O. Vilaseca, L.F. Vega
20 Years of the SAFT Equation: recent Advances and Challenges
19-21 September, Bellaterra (Spain)

Participation in Masters as invited lecturers:

1. L.F. Vega

Title: Searching for sustainability through CO₂ capture, transformation and utilization

Master in Environmental Studies

1 March 2010, UAB, Barcelona

2. L.F. Vega

How to use CO₂; Capture, Transformation and Utilities

Master in Applied Physics, Universidad de Vigo

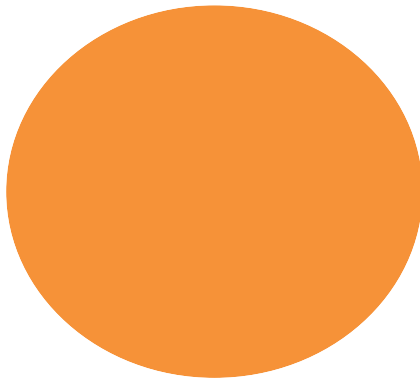
30 April, University of Vigo, Spain

3. L.F. Vega

Scientific Investigation within the Private Sector

III Encounter Postgraduates - Businesses

5 May, University of Huelva, Spain





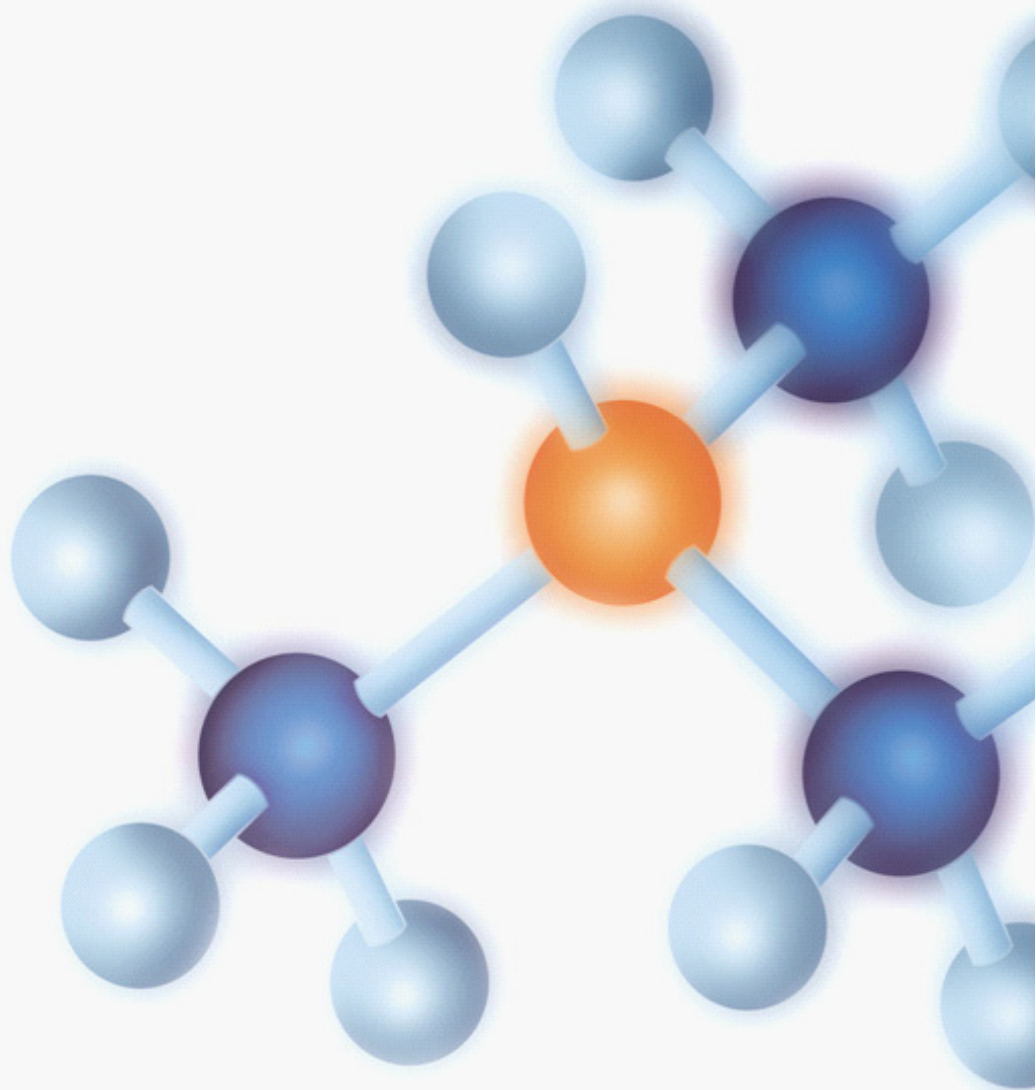
EXTERNAL RECOGNITION

- Dr. L. Vega was elected as one of 16 “Women in Science” in Catalonia. This is an itinerant exhibition opened on 23 February in Barcelona to be held in different parts of Spain.

- Dr. L. Vega was interviewed on Spanish Television – Channel TV2 - on 13 April in a program related to Women in Executive Positions.

- Dr. I. Salvadó participated in a brokerage event in Barberà del Vallès, organized by Nodus Barberà. The objective was to help companies and research centers in the field of packaging to exchange needs and expertise and to identify possible collaboration projects. 13 July, 2010

J. Comas participated in an event organized by Acció10 on how to hire qualified employees. 21 September, Fundació Bosch i Gimpera, Parc Científic de Barcelona i Biocat, Barcelona (Spain)



STUDENTS AT MATGAS





PhD THESIS AND OTHER RESEARCH WORKS

PhD thesis defended in MatGas financed by MatGas projects – UAB student

Title: Síntesis combinatoria y caracterización de capas finas para el almacenamiento de hidrógeno
Author: Dr. Roger Doménech
Dept. Physics
Director: Javier Rodríguez-Viejo/Gemma Garcia
Grade: Excellent cum laude

Title: Nanocalorimetría en capas ultrafinas de agua amorfa y tolueno.
Author: Dr. Edgar León
Dept. Physics
Director: Dr. Javier Rodríguez-Viejo
Grade: Excellent cum laude

Diploma of Advanced Studies (Master), financed by MatGas projects



Title: First approximation for the design of adsorbent materials for CO₂ capture using supercritical fluid technology
Author: Pedro López-Aranguren Oliver (CSIC-MATGAS)
Director: Dr. Lourdes F. Vega & Dr. Concepción Domingo



Title: Efecte de l'envasament en atmosfera modificada i de la tècnica de saturació amb diòxid de carboni sobre la vida útil i la qualitat de cuixetes de pollastre fresques
Author: Aida Al-Nehlawi Valverde (MATGAS)
Director: Dr. Sonia Guri & Dr. Jordi Saldo

Thesis under development at MATGAS



Student: Mr. Abel Roigé Godia
Title: Organic photovoltaic cells
Supervisor: Dr. J. Oriol Ossó



Student: Oriol Vilaseca i Vidal (CSIC-MATGAS)
Title: Molecular modelling of interfacial properties of important relevant fluids
Supervisor: Dr. Lourdes F. Vega & Dr. Fèlix Llovell



Student: Santiago Builes (CSIC-MATGAS)
Title: Modeling of CO₂ adsorbents
Supervisor: Dr. Lourdes F. Vega



Student: Pedro López-Aranguren Oliver (CSIC-MATGAS)
Title: Materials and process desing for CO₂ utilization and storage: theoretical and experimental approach
Supervisor: Dr. Lourdes F. Vega & Dr. Concepción Domingo



Student: Aida Al-Nehlawi Valverde (MATGAS)
Title: New complementary technologies to the preservation of foods with modified atmosphere
Supervisor: Dr. Sonia Guri & Dr. Jordi Saldo

Final Engineering Project Students.



Student: Ms. Sandra Pardilla
Title: Argon evaluation versus nitrogen in modified atmosphere packaging of food
Supervisor: Dr. Sonia Guri



Student: Ms. Ariadna Peral
Title: Investigation of new sorbents for post-combustion capture of CO₂ at low temperature through a combined experimental and modelling approach
Supervisor: Dr. Roberta Pacciani & Dr. Lourdes Vega



Student: Mr. Daniel Ruso
Title: Synthesis of novel Ca-Al oxides for capturing CO₂ at high temperature
Supervisor: Dr. Roberta Pacciani & Dr. Lourdes Vega



Student: Mr. Juan Antonio Vega
Title: Life cycle assessment of Microbial Electrolytic Cells (MEC) versus conventional methods for wastewater treatment
Supervisors: Dr. Roberta Pacciani & Dr. Lourdes Vega

International / ERASMUS Students

ERASMUS students:



Student: Mr. Rui Gonçalves
Title: State of the art of the microalgae and photosynthetic for biomass applications, including hydrogen generation and CO₂ capture
Supervisor: Dr. Lourdes Vega, Dr. Sonia Guri



Student: Mr. Falk Anger
Title: Photoluminescence in coevaporated pentacene-perfluoropentacene films
Supervisor: Dr. Oriol Ossó



Student: Ms. Aurelia Iatco
Title: Life cycle analysis applied to the reutilization of black liquors
Supervisor: Dr. Roberta Pacciani



Student: Mr. Edoardo Valente
Title: Solubility of CO₂ in ionic liquids using molecular modeling techniques
Supervisor: Dr. Fèlix Llovell, Dr. Lourdes F. Vega

International Student:



Student: Mr. Nicolas Jung
Title: Thermodynamic modeling of aqueous systems
Supervisor: Dr. Fèlix Llovell

Summer Internships



Ms. Ana María Montagut
UAB Summer Internship - Chemistry
Synthesis of nanostructured metal oxides
MATGAS Supervisor: Dr. J. Oriol Ossó



Ms. Laura Esquiús
UB Summer Internship – Chemical Engineering
Safety implementation in research labs
MATGAS Supervisor: Mr. Joaquim Torres



Ms. Georgina Faura
UAB Summer Internship – Chemistry
Controlled atmosphere packaging
MATGAS Supervisor: Dr. Sonia Guri



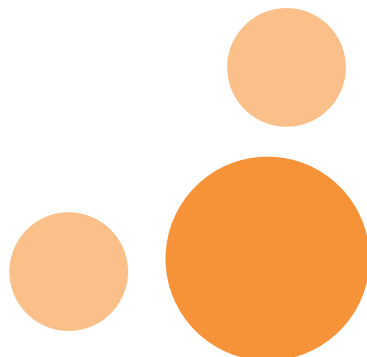
Mr. Aleix Torner
UPC Summer internship – Industrial Engineering
Materials for CO₂ capture
MATGAS Supervisor: Dr. Roberta Pacciani



Mr. Antoni Franco
Summer Internship Student (UAB)
Set-up of a UV/VIS spectrophotometer
MATGAS Supervisor: Dr. J. Oriol Ossó



Mr. Eric Gonzalez
UAB Internship – Chemistry
Life cycle analysis
MATGAS Supervisor: Dr. Roberta Pacciani



Welcoming New MATGAS Employees:



1. Ms. Elena López, Project Assistant. Elena is a **MATGAS** employee since November 15th, 2009. She joined the team to assist in the administrative tasks of the funded projects



2. Ms. Helena Lundquist. Executive technical assistant. Helena joined **MATGAS** as an Air Products employee starting on January 15th, 2010. She is replacing Ms. Montse Salas. As an executive technical assistant she will support tasks related to the direction of the center, as well as publication and outreach programs.



3. Dr. Raquel Ramirez, Laboratory Technical Coordinator. Raquel became a **MATGAS** employee on February 1st, thanks to a prestigious grant from the Catalan Government, a Talent grant, aimed at supporting the contract of personnel to small companies. She holds a PhD in Chemical Engineering from the Universitat Politècnica de Catalunya



4. Ms. Wounjim Chang. Research Assistant. Won joined **MATGAS** as an Air Products employee starting on February 15th, 2010. She will work in tasks related to the BIOSOS project, as well as in other research and engineering activities of the center



5. Mr. Patricio Martin. R&D Project Development. Patricio joined **MATGAS** as an Air Products employee starting on February 22nd, 2010. He will work on some of the running projects at MATGAS related to modeling as well as safety implementation.

MATGAS Employees who left us:



1. Mr. Ignasi Salvadó, joined **MATGAS** in March 2008 as a Research Project Manager . Ignasi is a Chemical Engineer from the University Rovira i Virgili (Spain) and obtained his PhD. degree in Engineering by the University of Nottingham (UK). He left the company in September 2010 and we wish him all the best for the future.



4. Mrs. Montse Salas joined **MATGAS** in June 2007 and gave support to the Director as an Executive technical assistant in applying and coordinating research projects, grants and contracts, both national and international. She left the company in January 2010 and we wish her the best of luck in her new workplace.

IN **M**EMORIAM



IN MEMORIAM Carlos Valenzuela

CARLOS, HASTA SIEMPRE Y GRACIAS

Carlos, a man of principles, a passionate person, full of life and projects and with a great sense of humor, has left us. He has been preparing this departure since some time ago, but the truth is that we were not ready for it yet. Carlos, the good colleague, the excellent professional, the passionate soccer player, the devoted husband, the loyal friend, is gone... but his memory, his work, and his footprint will remain forever in many of us, together with many anecdotes to share.

What I would like to share with you today are some memories related to his impact in MATGAS, Spain. MATGAS fits very well into Carlos' vision, enthusiasm and character, as it was a dream and a challenge for any one. Thinking of a joint venture for developing technology, in a far away Country, with a recently acquired company and with two other partners, is a real challenge, and Carlos liked it from the very beginning. To a very great extent it is thanks to Carlos' persistence, effort and work that MATGAS became a reality. When this started in the late nineties Carlos was the one who talked to the different partners in Spain, and to the different people involved in Allentown, he had the vision and he knew how to accomplish it. He also knew how to always adapt the language so that different cultures would not be an obstacle for pursuing any objective. With tenacity he put the seed for the labs and the relationships among all of us. It is not that he only talked with the people at the top level; on the contrary, he was an approachable person, talking to anyone, giving his honest advice, without being concerned about the other person being upset, but just trying to help. During all these years he has continued his endeavor: from the inauguration of the building and the labs, to the definition and approval of the strategic plan, Carlos was always available and ready to help. This was done with the right level of involvement, so that we could grow by ourselves but without being alone. And this was, in many instances, his way of working and doing. He was there if you needed him, but he was never pushing or forcing.

Last year, shortly after his retirement from Air Products and the Board of Directors of MATGAS, we had the opportunity to thank him personally for his contribution to MATGAS and to the development of the R&D projects for Air Products in Spain. We could share many anecdotes with him and the different people he met along these years in Barcelona, together with Luz, his wife. As in any other event where Carlos was involved, this was a very distended and enjoyable event. He revised the most difficult times of these years with a great sense of humor and he also emphasized the positive things that have been accomplished. We are indebted to Carlos for all he has done to MATGAS and to all of us.

Gracias por todo lo que nos has dejado y hasta siempre, Carlos.

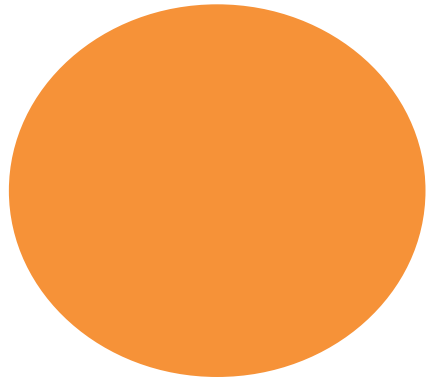
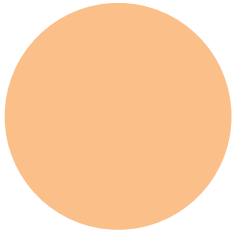
Dr. Lourdes F. Vega, in representation of the MATGAS Board, employees and friends.

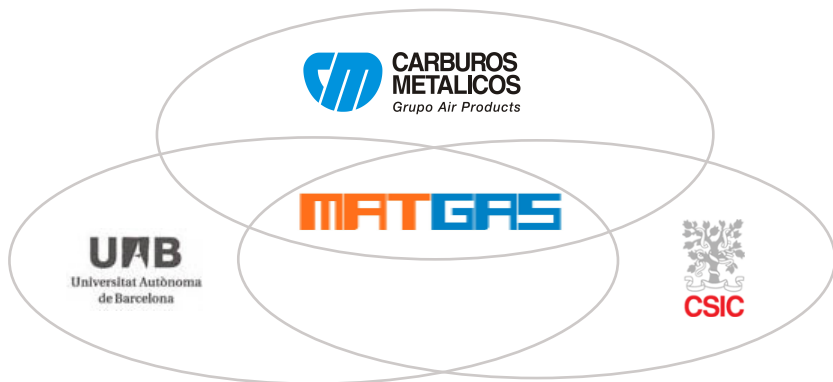


MATGAS

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de Barcelona







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