

Maibelin Rosales Vera

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ACADEMIC BACKGROUND

2015-2019

Chile

PhD in Engineering Sciences, Material Sciences

University of Chile

Doctoral thesis: "Controlled synthesis of nanostructured metal-oxide semiconductors and its effect on the polluted water treatment by heterogeneous photocatalysis".

2001-2006

Venezuela

Chemical Engineering

National Experimental Polytechnic University "Antonio José de Sucre"

FIELDS OF EXPERTISE/RESEARCH INTERES

Strong focus on basic research and R&D to design, produce, and characterize tunable multifunctional nanomaterials for hydrogen production, water treatment, and seawater desalination:

- High-performance photo-thermal and photo-active nanomaterials for green hydrogen production via photocatalytic water dissociation.
- Design and development of function-tailored low-dimensional metal oxide semiconductors (i.e. precise control over the dimensionality, morphology, band structures, and surface chemistry) for heavy metals and organic pollutants removal from water through adsorption and advanced photo-oxidation.
- Integration of nanomaterials into polymeric membranes during the polymerization to engineer dual function desalination and anti-fouling membranes.
- A strong background in the morphological and nano/microstructural characterization of materials by HRTEM and SEM. Expertise in physicochemical and photochemical analysis of materials.

RESEARCH PROJECTS PARTICIPATION

2022 - 2025

Chile

Fondecyt Postdoctoral, project N° 3220433, ANID. "**Morphological design of nanostructured photothermal semiconductors for green Hydrogen production by solar-photocatalytic dissociation of water**". Principal Researcher.

2022-2025

Chile

Fondecyt Regular, ANID. "**Novel photothermal nanocomposite membranes for solar-driven membrane distillation applied to recover water from acid mining drainage**". Co-Investigator, Director: Andreina García

2021 - 2022

Chile

ANID 2021 Strategic research fund on drought. "**Technology and advanced modelling for increased water recovery and remediation in tailing storage facilities for sustainable reuse**". Associate Researcher, Director: Yasna Tapia.

2020 - 2022

Chile

FONDEF IT, Technological Research. IT19I0006. CONICYT. "**Pilot plant of the water treatment system for the removal of arsenic using nanomaterials and solar energy, SolArsenic, validated under real conditions**". Postdoctoral Researcher, Director: Andreina García.

2018 - 2022

HORIZON 2020 European Commission Research and Innovation, project 778412.

European Union - Chile	International Network on Ionic Deep Eutectic Solvent Based Metal Organic Frameworks Mixed Matrix Membranes -INDESMOF- <u>Researcher</u> , Director: Roberto Fernández de Luis.
2020 Chile	Milenio. Millennium Nucleus of Multifunctional Materials for Applied Surface Science -MultiMat- <u>Postdoctoral Researcher</u> , Director: Judit Lisoni.
2018 - 2020 Chile	Associative Research on Science and Technology. ACM170003. CONICYT. “New applications of copper nanoparticles from mining products on emerging technologies for Desalination Process and Energy production” . <u>Researcher</u> , Director: Andreina García.
2016 - 2018 Chile	FONDEF-IDeA, CONICYT, ID15I10086. “Water treatment equipment for the removal of arsenic using nanomaterials and solar energy (SolArsenic)” . <u>Researcher</u> , Director: Andreina García.
2013 - 2015 Venezuela	PEI, Ministry of Science and Technology. Project 2014000515 “Hydrogen photoproduction as an alternative energy source from polluted water and sunlight” . <u>Principal Researcher (Director)</u> .
2012 - 2015 Venezuela	Semeruco 1018, Venezuelan Institute for Scientific Research. “Design and synthesis of photosensitizers” . <u>Researcher</u> , Director: Tamara Zoltan.
2012 - 2014 Venezuela	PEI, Ministry of Science and Technology. “Improvement of photocatalytic materials by inclusion of photosensitizers for industrial waste removal” . <u>Researcher</u> , Director: Tamara Zoltan.
2010 - 2012 Belarus-Venezuela	Belarus-Venezuela International Agreement, Ministry of Science and Technology (H2-Nano-IVIC-BEL). “Production of hydrogen and carbon nanotubes from hydrocarbons” . <u>Collaborator</u> . Director: Juan Matos.
2007 - 2010 Cuba-Venezuela	Cuba-Venezuela International Agreement, Ministry of Science and Technology (FOTCAT-IVIC-Cub). “Heterogeneous photocatalysis for the treatment of polluted water” . <u>Researcher</u> . Director: Juan Matos.
2007- 2009 Venezuela	LOCTI, Ministry of Science and Technology (LOCTI-CEL-IVIC). “Production of solar cells sensitized with natural dyes” . <u>Collaborator</u> . Director: Juan Matos.
2007- 2009 Venezuela	Semeruco 1211, Venezuelan Institute for Scientific Research. “Synthesis, characterization, and applications of Activated Carbon” . <u>Researcher</u> . Director: Juan Matos.

PROFESSIONAL EXPERIENCE

Jan 2020 - Currently Santiago, Chile	Advanced Mining Technology Center (AMTC), University of Chile. <u>Post-Doctoral Researcher</u> Tasks realized: Design, production, and characterization of nanomaterials for green hydrogen generation by photocatalytic dissociation of water; pollutants removal from natural surface and groundwaters by adsorption and photocatalysis processes. Synthesis and characterization of modified polymeric membranes with anti-fouling properties for seawater desalination process
Jan 2020 - Jul 2020 Santiago, Chile	University of Chile, Millennium Nucleus MultiMat <u>Post-Doctoral Researcher</u> Tasks realized: Advanced characterization of nanostructured materials by transmission and scanning electron microscopy (HRTEM and SEM techniques). Morphological, topological, nano/structural, and elemental analysis.

Jul 2018 - Jan 2019 <i>Montreal, Canada</i>	McGill University, Mining and Materials Engineering Department <u>Visiting Researcher</u> Tasks realized: Morphological, topological and elemental analysis of nanostructured metal-oxide semiconductors by field emission Scanning Electron Microscopy (SEM technique).
Mar 2016 - Jul 2018 <i>Santiago, Chile</i>	Advanced Mining Technology Center (AMTC), University of Chile <u>Researcher</u> Tasks realized: Synthesis and characterization of metal oxide nanomaterials and carbon-based adsorbents for application in heavy metals removal from polluted water.
Jun 2007 - Mar 2015 <i>Caracas, Venezuela</i>	Venezuelan Institute for Scientific Research (IVIC), Chemistry Center <u>Researcher</u> Tasks realized: Design, synthesis, and characterization of photosensitizers and novel nanomaterials (Me-Ox semiconductors, metal catalysts, carbon-based materials) for application in fields as catalysis, photocatalysis and energy generation from methane reforming reaction.

ACADEMIC EXPERIENCE

Nov 2021 - Currently <i>Lima, Perú (online mode)</i>	Engineering and Technology University, Department of Material Engineering <u>Invited Professor</u> Course taught: Materials Science.
Aug 2016 - Jan 2017 <i>Santiago, Chile</i>	University of Chile, Department of Civil Engineering <u>Teaching Assistant</u> Course taught: Environmental Engineering.
Mar 2010 - Mar 2013 <i>Caracas, Venezuela</i>	Aragua Bicentenary University. Engineering Department <u>Lecturer</u> Course taught: Mathematics, and Statistic.
Apr 2005 - Mar 2006 <i>Barquisimeto, Venezuela</i>	National Experimental Polytechnic University “Antonio José de Sucre”, Department of Chemical Engineering <u>Teaching Assistant</u> Course taught: Chemistry Laboratory, Organic Chemistry.

PATENTS

Rosales M*, Orive J., García A., **International Patent Application No. PCT/CL2022/050015**. 14/02/2022. “A TiO₂-based nanomaterial (TiO₂-H) and its synthesis method, with bifunctional property to photo-oxidize arsenic III, and simultaneously adsorb arsenic V in one step, for arsenic removal from natural surface and groundwater”.

PUBLICATIONS

- García A., **Rosales M.**, Thomas M., Golemme G. “Arsenic photocatalytic oxidation over TiO₂-loaded SBA-15”. *Journal of Environmental Chemical Engineering*, 9, 106443, 2021. <https://doi.org/10.1016/j.jece.2021.106443> FI: 5.909.
- Rosales M.***, Orive J., Epinoza-González R., Fernández de Luis R., Gauvin R., Brodusch N., Rodríguez B., Gracia F., García A., “Evaluating the bi-functional capacity for arsenic photo-oxidation and adsorption on anatase TiO₂ nanostructures with tunable morphology”. *Chemical Engineering Journal*, 415, 1, 1289062021, 2021. <https://doi.org/10.1016/j.cej.2021.128906> FI: 10.652.

3. González Saiz P., Valverde A., González-Navarrete B., **Rosales M.**, Quintero, Y. M., Fidalgo-Marijuan A., Orive J., Reizabal A., Larrea, E., Arriortua M. I., Lanceros-Méndez S., García A., Fernández de Luis R. "Modulation of the Bifunctional CrVI to CrIII Photoreduction and Adsorption Capacity in ZrIV and TiIV Benchmark Metal-Organic Frameworks". *Catalysts*, 51, 1-14, 2021. <https://doi.org/10.3390/catal11010051> FI:3.708.
4. **Rosales M.**, García A., Fuenzalida V. M., Espinoza-González R., Song G., Wang B., Yu J., Gracia F., Rosenkranz A. "Unprecedented Arsenic photo-oxidation behavior of few- and multi-layer Ti_3C_2Tx nano-sheets". *Applied Materials Today*, 20, 100769, 2020. <http://dx.doi.org/10.1016/j.apmt.2020.100769> FI: 8.352.
5. Fuentes S., Espinoza-González R., **Rosales M.**, León J. "Effects of Eu^{3+} on the morphological, structural and optical properties of $BaTiO_3@ZnO:Eu$ nanoparticles". *Journal of Alloys and Compounds*, 846, 156452, 2020. <http://dx.doi.org/10.1016/j.jallcom.2020.156452> FI: 4.65.
6. González Saiz P., Iglesias N., González Navarrete B., **Rosales M.**, Quintero Y. M., Reizabal A., Orive J., Fidalgo Marijuan A., Larrea E. S., Lezama L., García A., Lanceros-Mendez S., Arriortua M. I., Fernández de Luis R. "Chromium speciation in Zr-based Metal-Organic Frameworks for environmental remediation". *Chemistry*, 2020. <http://dx.doi.org/10.1002/chem.202001435> FI: 4.858.
7. **Rosales M.***, Zoltan T., Yadarola C., Mosquera E., Gracia F., García A. "The influence of the morphology of 1D TiO_2 nanostructures on photogeneration of reactive oxygen species and enhanced photocatalytic activity". *Journal of Molecular Liquids*. 281, 59-69, 2019. <http://dx.doi.org/10.1016/j.molliq.2019.02.070> FI: 5.065.
8. Rodríguez B., Oztürk D., **Rosales M.**, Flores M., García A. "Antibiofouling thin-film composite membranes (TFC) by in situ formation of Cu-(m-phenylenediamine) oligomer complex". *Journal of Material Science*. 53(9) 6325-6338, 2018. <http://dx.doi.org/10.1007/s10853-018-2039-4> FI: 3.442.
9. García A., Rodríguez B., Oztürk D., **Rosales M.**, Díaz D.I., Mautner A. "Incorporation of CuO nanoparticles into thin-film composite reverse osmosis membranes (TFC-RO) for antibiofouling properties". *Polymer Bulletin*. 75(5) 1-17, 2017. <http://dx.doi.org/10.1007/s00289-017-2146-4> FI: 1.858
10. Zoltan T., **Rosales M.**, Yadarola C. "Reactive oxygen species quantification and their correlation with the photocatalytic activity of TiO_2 (anatase and rutile) sensitized with asymmetric porphyrins". *Journal of Environmental Chemical Engineering*. 4(4) 3967-3980, 2016. <http://dx.doi.org/10.1016/j.jece.2016.09.008> FI: 4.3.
11. García A., Rodríguez B., Oztürk D., **Rosales M.**, Paredes C., Cuadra F., Montserrat S. "Desalination performance of antibiofouling reverse osmosis membranes". *Modern Environmental Science and Engineering*. 2(07) 481-489, 2016. [https://doi.org/10.15341/mese\(2333-2581\)/07.02.2016/007](https://doi.org/10.15341/mese(2333-2581)/07.02.2016/007)
12. Sifontes A.B., **Rosales M.**, Méndez F. J., Oviedo O., Zoltan T. "Effect of calcination temperature on structural properties and photocatalytic activity of ceria nanoparticles synthesized employing chitosan as template". *Journal of Nanomaterials*. 2013, 1-9, 2013. <http://dx.doi.org/10.1155/2013/265797> FI: 1.98.
13. Matos J., **Rosales M.** "Promoter Effect upon Activated Carbon-Supported Ni-Based Catalysts in Dry Methane Reforming". *Eurasian Chemical Technology Journal*. 14(1) 5-7, 2012. <http://dx.doi.org/10.18321/ectj91> FI: 0.8
14. Matos J., Paredes C., **Rosales M.** "Dry Methane Reforming on Carbon-Doped Nickel Foams". *Eurasian Chemical Technology Journal*. 14(1) 9-11, 2012. <http://dx.doi.org/10.18321/ectj92> FI: 0.8
15. Matos J., **Rosales M.**, García A., Nieto-Delgado C., Rangel Méndez J. R. "Hybrid Photoactive Materials from Municipal Sewage Sludge for the Photocatalytic Degradation of Methylene Blue". *Green Chemistry*. 13 (12) 3431-3439, 2011. <http://dx.doi.org/10.1039/c1gc15644f> FI: 9.405
16. Matos J., Nahas C., Rojas L., **Rosales M.** "Synthesis and characterization of activated carbon from sawdust of Algarroba wood. 1. Physical activation and pyrolysis". *Journal of Hazardous Materials*. 196, 360-369, 2011. <http://dx.doi.org/10.1016/j.jhazmat.2011.09.046> FI: 9.038
17. Matos J., Nahas C., Rojas L., **Rosales M.** "Texture Properties and Kinetic Parameters Associated to Carbon Materials Obtained from Sawdust of Algarroba Wood. 1. Application in Phenol Photodetoxification". *The Open Environmental Engineering Journal*. 4 (1) 1-10, 2011. <http://dx.doi.org/10.2174/1874829501104010001>
18. Matos J., **Rosales M.**, Titirici M. M. "Methane conversion on carbon-supported Pt-Ru nanoparticles alloy supported on hydrothermal carbon". *Applied Catalysis A: General*. 386(1-2) 140-146, 2010. <http://dx.doi.org/10.1016/j.apcata.2010.07.047> F.I: 5.006
19. Matos J., **Rosales M.**, Urbina de Navarro C., González G. "Changes on texture and crystalline phase of

Activated Carbon-Supported Ni-Ca Catalyst during Dry Methane Reforming". The Open Materials Science Journal. 4(1) 125-132, 2010. <http://dx.doi.org/10.2174/1874088x01004010125>

20. Matos J., **Rosales M.**, Urbina de Navarro C., González G. "Medusa-like carbon nanotubes formed during dry methane reforming on activated carbon-supported Ni-Ca catalyst". Acta Microscópica. 18(3) 322-332, 2009.

BOOK CHAPTERS

1. Valverde A., G.-Sainz P., Orive J., Larrea E., Reizabal-Para A., Rodríguez B., Quintero Y., **Rosales M.**, García A., Arriortua M.I., Fernández de Luis R., Book: Advanced Lightweight Multifunctional Materials. Chapter 3: "Porous, lightweight, metal organic materials: environment sustainability". 1st edition, (2020), pp 43-129. Elsevier Science. <https://doi.org/10.1016/B978-0-12-818501-8.00012-3>
2. Navas-Cárdenas C., Murillo H., **Rosales M.**, Ron C., Muñoz F. Book: New Technologies for Electrochemical Applications. Chapter 12: "Materials involved in electrocoagulation process for industrial effluents", 1st edition, (2020), pp 193-216. CRC Press. <https://doi.org/10.1201/9780429200205-12>

PRESENTATION AT NATIONAL/INTERNATIONAL CONFERENCES

1. **Nano Materials for the Energy and the Environment, NanoMatEn 2022.** The effect of TiO₂ surface chemistry on the solar light-induced arsenic removal from natural surface waters. Rosales M., Fernández de Luis R., García A., Paris-France, June 2022.
2. **Water Congress 2021.** Arsenic removal from water by using a combined system: nanotechnology and solar light. Rosales M., Hauser C., García A., Santiago-Chile, June 2021.
3. **V Escuela de técnicas de caracterización en baja dimensionalidad.** "Microscopía Electrónica de Barrido (SEM) para Semiconductores Nanoestructurados". M. Rosales. Santiago-Chile, July 2019.
4. **Gestión Eficiente del Recurso Hídrico. Un Desafío frente al Cambio Climático.** "Foto-nanomateriales para Remoción de Arsénico en agua". M. Rosales. Vallenar-Chile, June 2019.
5. **Workshop: Técnicas para Remediación de Arsénico.** "Arsenic removal from water using TiO₂ nanomaterials under solar light irradiation". M. Rosales*. Santiago-Chile. May 2018.
6. **Water Congress 2018.** Arsenic removal from water by employing TiO₂ nanomaterials under solar light irradiation. Rosales M., Orive J., Rodríguez B., Gracia F., García A. Santiago-Chile, May 2018.
7. **Water in Industry 2017.** Photodegradation of pollutants from water using nanomaterials and solar light irradiation. García A., Rodríguez B., Rosales M. Santiago-Chile, June 2017.
8. **III Taller Conversión de Energía Solar y Térmica.** "Metal-oxide Nanostructured materials with photocatalytic applications". Rosales M., Zoltan T., Yadarola C., García A., Mosquera E., Antofagasta-Chile, October 2016.
9. **IV Congreso Nacional de Nanotecnología 2016.** "Crecimiento controlado de nanoestructuras 1D de TiO₂ y su efecto en la degradación fotocatalítica de colorantes textiles". Rosales M., Zoltan T., Yadarola C., García A., Mosquera E., Olmúe-Chile, September 2016.
10. **XIII Interamerican Microscopy Congress.** "Effect of synthesis temperatura on the optical and photocatalitic properties of TiO₂ nanofibers by hydrothermal rute". Yadarola C., Rosales M., Zoltan T., Margarita-Venezuela, October 2015.
11. **Trends in Nanotechnology International Conference (TNT2014).** "Titanium Dioxide Nanofibers photosensitized with Porphyrin for Efficient Degradation of textile dyes in Water". Rosales M., Yadarola C., Zoltan T., Barcelona-Spain, October 2014.
12. **Jornada Nacional de Física de la materia condensada.** "Síntesis de nanomateriales de TiO₂ para la fotodegradación de contaminantes orgánicos". Rosales M., Zoltan T., Caracas-Venezuela, November 2013.
13. **2do Congreso Venezolano de Ciencia, Tecnología e Innovación. LOCTI-PEI.** Caracas-Venezuela, November 2013.
- "Efecto del pH en la fotodegradación del colorante textil Rojo Congo". Rosales M., Ballestas A., Zoltan T.

- “Síntesis y Caracterización Fotoquímica de la vanadilo tetrafenil porfirina”. Yadarola C., Zoltan T., Rosales M.
- 14. **Congreso Latinoamericano de Química CLAQ 2012.** “Efecto del proceso de lavado en la síntesis hidrotérmica de nanotubos de titanio”. Rosales M., Zoltan T., Sifontes Á., Cancún-México, October 2012.
- 15. **1er Congreso Venezolano de Ciencia, Tecnología e Innovación. LOCTI-PEI.** “Comparación en la Actividad Fotocatalítica de Nanotubos de Titanio en la Degradación de Rojo Congo”. Rosales M., Oviedo O., Zoltan T., Caracas-Venezuela, September 2012.
- 16. **Annual International World Conference on Carbon (Carbon2011).** Shanghai-China, July 2011.
 - “Dry methane reforming on carbon-doped Ni nanofoams”. Rosales M., Paredes C., Matos J.
 - “Promoter effect in dry methane reforming on Ni/Activated carbon catalysts”. Rosales M., Matos J.
 - “Photoactive carbon-based materials from municipal sewage sludge”. Matos J., Rosales M., García A., Nieto-delgado C., Rangel Méndez J. R.
 - “Methane conversion on Pt-Ru nanoparticles on hydrothermal carbon”. Matos J., Rosales M., Demir-Cakan R., Titirici M. M.
- 17. **EUROPACAT IX Congress.** “Promoters effect on Ni-based catalysts supported on activated carbon in dry methane reforming under mild experimental conditions”. Matos J., Quintana M., Rosales M., Salamanca-Spain, September 2009.
- 18. **Annual World Conference on Carbon,** (Carbon 2009). Biarritz-Francia, June 2009.
 - “Catalytic activity of Ni-based catalysts supported on activated carbon”, Rosales M., Matos J., Quintana M.
 - “In situ activation of carbon deposits formed during dry methane reforming on activated carbon-supported Ni-Ca catalyst”. Matos J., Rosales M., Urbina de Navarro C., Albornoz A., González G.
- 19. **International Carbon Conference, (Carbon 2008)** “Catalytic activity of carbon nano foams- supported Fe, Co and Ni catalysts”. Matos J., Francesconi M., Rosales M., Nagano-Japon. July 2008.
- 20. **XXI Simposio Iberoamericano de Catálisis.** Málaga-Spain, June 2008.
 - “Evolución de sales de hierro, cobalto y níquel soportadas en carbón activado y su actividad catalítica en la reformación seca de metano”. Rosales M., Francesconi M., Matos J.
 - “Efecto de la Temperatura de Reacción en la Reformación Seca de Metano sobre Catalizadores de Cobalto y Magnesio Soportados en Carbón Activado”. Rosales M., Francesconi M., Albornoz A., Urbina de Navarro C., Matos J.

AWARDS AND HONORS

- Doctoral scholarship No 21151390 (2015-2019). CONICYT (National Commission for Research, Science and Technology), Chilean government. Full scholarship of tuition and stipend funding for doctorate studies.
- Doctoral scholarship for research internship (2018-2019). CONICYT (National Commission for Research, Science and Technology), Chilean government. Internship carried out at McGill University, Montreal-Canada.
- Complementary doctoral scholarship for operational expenses (2017-2019). CONICYT (National Commission for Research, Science and Technology), Chilean government.
- Award Research Stimulus Program “PEI 2013-2015”, a program to support highly qualified researchers and honor for scientific productivity. Ministry of Science and Technology, Venezuela.
- Award Research Stimulus Program “PEI 2011-2013”, a program to support highly qualified researchers and honor for scientific productivity. Ministry of Science and Technology, Venezuela.
- Excellence Undergraduate Scholarship (2002-2006). Fundación Gran Mariscal Ayacucho (Fundayacucho), Ministry of Education, Venezuela. Full scholarship of stipend funding for undergraduate studies

UNDERGRADUATE THESIS SUPERVISION

- Maria Isabel Diaz. Title: “Selection and design of a TiO₂-based nanomaterials separation stage from treated water by photocatalytic processes”. Chemical Engineering. Universidad Tecnológica Metropolitana, Chile.

October 2020 - Currently. Co-Advisor Professor.

- Ciro Yadarola. Title: "Design and upscaling of a pilot plant for phthalocyanines production". Chemical Engineering. Instituto Universitario de Tecnología "Dr. Federico Rivero Palacio" (IUT), Venezuela. March 2015. Advisor Professor.
- Dangelys Vera. Title: "Synthesis of carbon nanostructures on nickel-based catalysts by ethylene catalytic cracking". Petrochemical Engineering. Universidad Nacional Experimental Politécnica de la Fuerza Armada Nacional Bolivariana (UNEFA), Venezuela. March 2011. Co-Advisor Professor.
- Carlos Paredes. Title: "Dry methane reforming on nickel nanocarbon networks". Petrochemical Engineering. Universidad Nacional Experimental Politécnica de la Fuerza Armada Nacional Bolivariana (UNEFA), Venezuela. March 2010. Co-Advisor Professor.

ACADEMIC AND PROFESSIONAL REFERENCES

- Prof. Dr. Andreina García, Senior Researcher of Advanced Mining Technology Center (AMTC), Associate Professor Universidad de Chile. e-mail: andreina.garcia@amct.cl. +56 2297 1015
- Prof. Dr. Juan Matos Lale. Professor / Senior Academic. Facultad de Ingeniería, Universidad Autónoma de Chile. e-mail: juan.matos@uautonoma.cl.
- Prof. Dr. Raynald Gauvin, Professor. Department of Materials Engineering. McGill University, Montreal - Canadá. e-mail: raynald.gauvin@mcgill.ca. +1 (514) 398 8951.
- Dr. Roberto Fernández de Luis, Researcher. BCMaterials, Basque Center for Materials, Applications & Nanostructures. Basque Country- Spain. e-mail: roberto.fernandez@bcmaterials.net. +34 94 612 8811