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Argentina

Selected Technology Offer

Polymers

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Technology Offer of Patents, Products and Methods of Technological Interest

Composite Resins for Direct Dental Restoration

Technology Description

Composite resins are materials widely used in odontology. They are made of a combination of several bimetacrylic monomers, filling materials and a photoreactive system. Due to the continuous research in material sciences, the physical, mechanical and biocompatible properties of the composite resins have significantly improved. Despite these advances, actual composite resins present limits such as discoloration problems, abrasion and mechanical defects. Among mechanical limits, polymerization contraction is an important cause of dental restoration failures.

The present technology refers to five composite resins to be used in direct dental restoration, based on the use of five novel bis-glycidylmetacrylate monomers. These composite resins showed improved mechanical properties with respect to the actual composites resins.

Application

- Use in direct dental restoration.

Advantages

- The prepared composite resins showed improved mechanical properties with respect to the actual composites resins. These characteristics increase their resistance and durability.

Development Status

Measurement of mechanical properties is in accordance with international guidelines.

Patent Status

Priority date: 28/12/2012. Priority number: AR20120105084. Priority application country: Argentina.

Scientific Leader

Norma D'Accorso, PhD

Keywords: Human Health, Direct Dental Restoration, Composite Resins.

Pharmaceutical Excipient for Orally Disintegrating Tablets

Technology Description

Excipients are substances lacking of pharmacological activity, used to formulate active principles under a given pharmaceutical form. They present a definite functional role impacting on the production process and on the quality, safety and efficacy of the medicine.

This technology describes the use of an excipient, consisting of a polyalcohol and a water-soluble polymer, which favours disintegration/dissolution of oral tablets in the mouth cavity in just a few seconds, with no need to ingest water.

Application

- Use in the formulation of active ingredients either alone or with the addition of flavourings and colourings, in the pharmaceutical industry.

Advantages

- Fast disintegration and dissolution, maintaining the hardness of the tablet.
- Pleasant taste.
- Easy compacting and uniform size.
- Simple to obtain, avoiding the use of organic solvents.
- Easy to scale up.
- Water-soluble.
- Low cost and easy accessibility.

Development Status

Proof of concept has been accomplished and the product is ready for scale-up.

Patent Status

Priority date: 21/05/2012. Application number: AR2012P101793. Priority application country: Argentina.

Scientific Leader

María Verónica Ramírez Rigo, PhD

Keywords: Drug formulation, Excipient,
Oral Administration, ODTs[+]
+ Orally Disintegrating Tablets

Prevention of Gastritis

Technology Description

The present probiotic technology consists of a strain of lactic acid bacteria that produce biopolymers to treat gastritis. More specifically, this technology may be presented as fermented milk (*St. thermophillus* CRL 1190) that is effective to both prevent as well as to treat this pathology, thanks to the production of exopolysaccharides, which reportedly are immunoregulators and have antiulcer properties.

Application

- Use in prevention and treatment of gastritis.

Advantages

- Natural treatment of gastritis that avoids side effects produced by conventional pharmaceutical treatments.

Strain

St. thermophillus CRL 1190

Development Status

Extensive *in vitro* and animal data. Ready for use in clinical trials.

Scientific Leader

Graciela Font de Valdez, PhD

Keywords: Probiotic, Prevention and Treatment, Gastritis.

Enzyme Biocatalyst in Lysozyme Amyloidal Fiber Support

Technology Description

A nanotechnological method is introduced to obtain lysozyme amyloidal fiber support, without neither biological nor enzyme activity, that can be used for the immobilization of lipase enzyme by means of a photochemical reaction. The biocatalyst thus obtained is highly stable as compared to free lipase enzyme.

This support is based upon lysozyme polymerization in the presence of heparin to obtain amyloidal fibres resembling carbon nanotubes. It can be used for biocatalysts manufacturing by conjugation with various enzymes, such as lipases of importance in industrial processes.

Applications

- Biodiesel ecologically clean synthesis: starting fatty acid esters (biodiesel) usable as biofuel and glycerol by-product are obtained starting from vegetable oil.
- Aroma and flavour compounds used as additives in food, cosmetic and pharmaceutical industry are obtained.
- Fats and oils modification: lipids´ properties can be modified by lipases, obtaining in this way high added value fats from cheap lipids and with undesirable properties. These compounds are of interest both for food and pharmaceutical industry.
- Obtainment of pure enantiomers by means of racemic mixtures using lipase enzyme. The pharmaceutical industry aims at the resolution of racemic mixtures to obtain pure chiral drugs.

Advantages

- Nanotubes (amyloidal fibre) of lysozyme present a large variety of functional groups that when reacting with other proteins allow the production of new functional materials.
- The lipase enzyme immobilization method by photosensitization is highly efficient, rapid and non-toxic.
- The biocatalyst comprised by a lipase in a lysozyme amyloidal fibre solid support is stable in broad ranges of pH and temperature, and allows the enzymatic reaction in organic solvents, unlike the lipase reaction when on soluble state.

Development Status

The concept test has been carried out obtaining highly satisfactory results for different suggested applications.

Patent Status

Priority date: 02/07/2012. Application number: AR2012P102400. Priority application country: Argentina. PCT application date: 01/07/2013, PCT application number: PCT/IB2013/055405.

Scientific Leader

Rosana Nieves Chehín, PhD

Keywords: Enzyme Immobilization,
Biocatalyst

Edible, Biodegradable, Biocompatible and Non–toxic Material

Technology Description

The technology consist of an edible, biodegradable, biocompatible and non–toxic material that comprises a matrix composed by starch, glycerol and starch nano–crystals dispersed in the matrix. Specifically, the starch matrix is formed by tapioca starch, while the nano–crystals are corn starch nano–crystals.

The material may be used in the form of foils, sheets, films, coatings, gels, etc, to isolate and/or to protect a product from the environment.

Applications

- Isolate and/or protect food (fresh food, cheese, confections, etc.), pharmaceutical products, cosmetics, and cleaning products
- Substitute the typical stretchable PVC films used to protect, among others, fruits or products found in trays of so–called 'fast food'
- Sheets of the invention may be used for manufacturing of bags, in particular envelope bags type

Advantages

- Completely thermoplastic, renewable, and flexible, and can be easily conditioned to different processes of heat plasticization by employing equipment commonly used in the manufacturing of synthetic polymers
- Low cost of manufacturing
- More resistant to damage than conventional films
- Colourless, tasteless and odourless
- Apt to change its colour, smell or taste, using pigments, and has the property of transferring natural antimicrobials
- It preserves the organoleptic quality of food for a longer period
- Unique properties of water vapour permeation, mechanic resistance and transparency

Development Status

All the proof of concept has been accomplished and the product is ready for scale-up.

Patent Status

Priority date: 01/08/2010. Application number: AR2010P100044. Pending in: USA, Mexico Brazil, Peru and Argentina.

Scientific Leader

Silvia Nair Goyanes, PhD

Keywords: Biofilms, Food Preservation.

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PARASITOLOGY

Rosario Institute of Chemistry

National University of Rosario

IQUIR, acronym for "Instituto de Química de Rosario"

General Research Topic

- Microencapsulation of drugs, microorganisms and enzymes.

Research Lines

- Development of new liquid and solid formulations of parasiticides in the form of drops, oral and injectable solutions and suspensions, tablets, capsules, microparticles, powders.
- Development of new formulations of levamisole and ivermectin, useful for treating heartworm disease.
- Controlled release of analgesics.

Examples of Developments

- Polymeric microparticles for oral delivery of antiparasitics (benzmidazoles, nitroimidazoles) (patented)
- Parenteral formulations of trypanocides.

Fields of Application

- Animal health.
- Human Health.

Publications

- *In vivo evaluation of albendazole microspheres for the treatment of* Toxocara canis larva migrans. EUROPEAN JOURNAL OF PHARMACEUTICS AND BIOPHARMACEUTICS; United States; Year: 2010 vol. 75 p. 451 - 454. BARRERA, M.G.; LEONARDI D.; BOLMARO, R.; ECHENIQUE, C.; OLIVIERI, A.C.; SALOMON C.J.; LAMAS M.C.
- *Development of novel formulations for Chagas' disease. Optimization of benznidazol chitosan microparticles based on artificial neural networks.* INTERNATIONAL JOURNAL OF PHARMACEUTICS; New York; Year: 2009 vol. 367 p. 140 - 147. LEONARDI D.; SALOMON C; LAMAS, M.C.; OLIVIERI, A.C
- *Swellable Matrices for the Controlled-Release of Diclofenac Sodium. Formulation and In-Vitro Studies.* PHARMACEUTICAL DEVELOPMENT AND TECHNOLOGY; New York; Year: 2004 vol. 9 p. 75 - 83. BRAVO S.; LAMAS M.C.; SALOMON C.J.
- *Development of liquid dosage forms of Benzimidazole anti-helminthic agents.* BIOCELL; Year: 2004 vol. 28 p. 327 - 327. LEONARDI, D; LAMAS, M. C.; SALOMÓN, C. J.

Contact

Claudio Javier Salomon, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Material Science and Technology Research Institute

INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"

National University of Mar del Plata

General Research Topic

- Polymer matrix composite material.

Research Lines

- Polyvinyl alcohol-based composite gels for their use in biomedicine.

Examples of Developments

- **Polyvinyl alcohol Composite Hydrogels:**

  Controlled Release of Drugs

  - ✓ Optimisation of ferrogel synthesis routes for controlled release of drugs.
  - ✓ Development and optimisation of different chemical formulations based on biocompatible polymers and nano-reinforcements for controlled release of oncological drugs.

  Dressings

  - ✓ Development of PVA/nano-reinforcement composites of natural and in-country (cellulose and bentonite) origin for their use in bandages and dressings.

  Joint Replacement

  - ✓ Development of commercial PVA/hydroxyapatite composites for joint replacement.
  - ✓ Development of multilayer hydrogels for joint replacement.

Fields of Application

- Controlled release of drugs.
- Biocompatible material

Contact

Vera Álvarez, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Material Science and Technology Research Institute

INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"

National University of Mar del Plata

General Research Topic

- Biomedical polymers.

Research Lines

- Formulation of polymer biomaterial composites with application in medicine (tissue engineering) and pharmacy (release of bioactive agents).
- Design of biomedical devices loaded with bioactive agents of natural origin (embelline and chalcones).
- Mechanical properties of biomaterials and characterisation techniques of biomaterials.

Examples of Developments

- Microfibre bioreabsorbable polymer matrix containing antifungal agents.
- Microfibre Structures: Polycaprolactone-embelline for increasing bioavailability of the bioactive agent.
- Mechanical characterisation of self-curing cement formulated with poly(methyl metacrylate)/poly(e-caprolactone) pearls.
- Influence of incorporating cross-linked pearls in the mechanical behaviour of acrylic-based bone cement.

Fields of Application

- Controlled release of drugs.
- Materials.

Contact

Teresita Cuadrado, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Institute of Technological Development for the Chemical Industry
INTEC, acronym for "Instituto de Tecnología para la Industria Química"
National University of Littoral

General Research Topic

- Development of micro- and nano-technologies for their use in veterinary and human medicine.

Research Lines

- Biopolymers for controlled release of drugs.

Examples of Developments

- Project for controlled release of hormones in microtablets for oestrus synchronisation in bovine cattle: PCT + Mercosur patented. Testing for *in vivo* effectiveness and transference in progress.
- Project for controlled release microfilms in cardiovascular implants: patentability analysis underway. Testing for *in vivo* effectiveness, transference in progress.
- Controlled release of drugs and micronutrients in nano-composites for hard tissue engineering. Patentability analysis underway. *In vitro* testing.

Fields of Application

- Controlled release of drugs.

Contact

Ignacio Rintoul, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Applied and Theoretical Physicochemical Research Institute

INIFTA, acronym for "Instituto de Investigaciones Físico-Químicas Teóricas y Aplicadas"

National University of La Plata

General Research Topic

- Nanomaterials of biomedical interest.

Research Lines

- Synthesis of gold and silver nanoparticles and nanobars, modified with organic layers presenting different functional groups. Nano-structures are subsequently derivatized with a biomolecule which, depending on the foreseen application, may be immobilised in a covalent manner or adsorbed on the nano-structure (e.g., by electrostatic interactions). In some cases, the main goal is the controlled release of the biomolecule.

Examples of Developments

- 'Naked' gold particles supported on HOPG: Melanin functionalization and analysis of its catalytic activity.
- Spontaneous adsorption of silver nanoparticles on Ti/TiO2 surfaces. Antibacterial effects on *Pseudomonas aeruginosa*.

Fields of Application

- Controlled release of drugs.

Contact

Carolina Vericat, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Córdoba Centre of Excellence in Products and Processes

CEPROCOR, acronym for "Centro de Excelencia en Productos y Procesos Córdoba"

General Research Topic

- Interaction of biopolymers and hydrotropic molecules with biological components: potential application in human health field.

Research Lines

- Design, characterisation, and application of biopolymers for controlled release of water insoluble drugs.
- Systems for the transport and controlled release of hormones to control estrous in bovine cattle.

Examples of Developments

- Glycosphingolipid nano-micelles for controlled release of therapeutically active substances whose molecules are highly hydrophobic, for example, oncological drugs.
- Method for controlling RNA extraction and inverse transcription steps as part of the diagnosis of the dengue virus in human blood samples.

Fields of Application

- Controlled release of water insoluble drugs.
- Diagnostics.

Contact

Dante Beltramo, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Pharmaceutical Technology Department. Pharmacy and Biochemistry School
University of Buenos Aires.

General Research Topic

- Biomedical materials and tissue engineering.

Research Lines

- Controlled release of antiviral composites.
- Microwave-assisted polymer synthesis.

Examples of Developments

- Pharmaceutical solutions containing polymer micelles and polymersomes for administration of retrovirals.

Fields of Application

- Modified release.

Contact

Alejandro Darío Sosnik, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE

Multidisciplinary Institute of Vegetal Biology

IMBIV, acronym for "Instituto Multidisciplinario de Biología Vegetal

National University of Cordoba

General Research Topic

- Polymers.
- Nanogels.
- Dendritic molecules.
- Nanostructures.

Research Lines

- Chemical modification of core-shell type magnetic nanoparticles for controlled release of oncological drugs.
- Separation of nanostructured biodegradable packaging.
- Synthetic films on hydrophilic or superhydrophobic nanostructured films.

Examples of Developments

- Study for optimising the synthesis and properties of chitosan-grafted biocomposite films, and the study of its incorporation and cytotoxicity in three cell lines.
- Synthesis, characterisation, and controlled release of hydrogel drugs with potential applications as biomaterials, based on N-acryloyl-tris (hydroxymethyl) aminomethane (hidroximetil) y N-isopropylacrylamide.
- Thermosensitive nanogels based on dendritic polyglycerol and N-isopropylacrylamide structures for biomedical applications.

Fields of Application

- Controlled release of drugs.
- Nanomaterials.

Contact

Miriam Strumia, PhD

NANOBIOTECHNOLOGY – NANOMEDICINE – NANOMAGNETISM

South Chemistry Institute

INQUISUR, acronym for"Instituto de Química del Sur"

National Southern University

General Research Topic

- Nanomaterials with magnetic properties applied in biomedicine and for remediation of environmental problems.

Research Lines

- Design, characterisation, and application of nanocomposites with magnetic properties based on iron oxides and different modifiers, such as stabilizing polymers, biomolecules, and monomers.
- Transport and controlled release systems of drugs in specific sites capable of preventing or minimizing severe side effects.

Examples of Developments

- Magnetic nanoparticles for encapsulating non-steroidal anti-inflammatory drugs.
- Nanoparticles for encapsulating pain relief drugs.
- Design of biocatalysts by using nano-, micro-, and macroparticles with magnetic properties.

Fields of Application

- Controlled release of drugs.

Contact

Verónica Lassalle, PhD

NANOTECHNOLOGY FOR MATERIALS AND SURFACE SCIENCE – NANOBIOTECHNOLOGY – NANOMEDICINE

Rosario Chemical Institute

IQUIR, acronym for "Instituto de Química Rosario"

National University of Rosario

General Research Topic

- Studies on co-solvency and chemometric optimisation for liquid pharmaceutical forms.

Research Lines

- Studies at the border between chemistry and biology.
- Polymers and macromolecules applied to the development of microparticles for the transport of drugs and microorganisms (probiotics).

Examples of Developments

- Composite containing modified release polymer microparticles for oral administration of antiparasitic substances.

Fields of Application

- Controlled release drugs.

Contact

Claudio Javier Salomón, PhD

PRESERVATION OF FOODSTUFF

Physics Institute of Buenos Aires

IFIBA, acronym for "Instituto de Física de Buenos Aires"

University of Buenos Aires

General Research Topic

- Polymers and composites.

Research Lines

- Synthesis of starch nanoparticles.
- Biodegradable nanocomposites.

Example of Developments

- Biodegradable and compostable starch–based films and starch nanoparticles aimed for packaging.

Fields of Application

- Food industry.
- Pharmaceutical industry.

Contact

Silvia Nair Goyanes, PhD

ECOMATERIALS

Material Science and Technology Research Institute

INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"

National University of Mar del Plata

General Research Topics

- Study of plant fibre–reinforced and biodegradable polymer composites.
- Study of polymers and composites obtained in full or in part from biomass.

Research Lines

- Composite and nanocomposite polymers from biomass: Vegetable oil–based polymers.
- Polymers with functional properties (e.g., chitosan/polyaniline, polyurethanes with shape memory).
- Influence of water absorption in the electrical properties of composite materials.
- Study of the influence of ZnO particle morphology in the final properties of composite materials.
- Application of renewable resources produced by different agronomic techniques for obtaining polymer matrix composites.
- Relation between thermorigid resin formulas and thermal, mechanical, and adhesive properties.

Examples of Development

- Development and characterization of polymer films either partially and/or totally biodegradable and reinforced with nanocellulose.
- Cellulose and starch nanocomposites.
- Food containers and coatings based on chitosan emulsions with olive oil, beeswax, propolis.
- Development of materials with nanofibres produced by electrospinning.
- Active films from biodegradable proteins and polymers.
- Thermorigid polymers and foams from renewable resources.
- Biogenic–based adhesives.
- Production of nanocellulose.
- Materials based on agro–industrial waste.
- Production of alternative concretes by reusing urban waste.

Material Science and Technology Research Institute

INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"

National University of Mar del Plata

General Research Topic

- Mechanics of materials.

Research Lines

- Polymer matrix composite materials.
- Innovative products based on composites.

Examples of Developments

- Development of composite materials for the wind power industry.
- Design and construction of wind turbine blade prototypes at a small scale.
- Development of composite resins and materials modified with nanoclays to increase material resistance to wet environments.
- Modelling of composite material properties and optimisation of laminated structures.
- Optimisation of SCRIMP (vacuum infusion) process variables for the manufacture of windmill blades.

Fields of Application

- Sustainable environment and development.

Contact

Exequiel Rodríguez, PhD

MEM (MICROELECTROMECHANICAL SYSTEMS), FLUIDICS COMPONENTS, AND WAFERS

Institute of Technological Development for the Chemical Industry
INTEC, acronym for "Instituto de Tecnología para la Industria Química"
National University of the Litoral

General research topics

- Electro-optical properties of micro and nanocrystalline semiconductors.
- BIOMEMS (BIOLOGICAL MICROELECTROMECHANICAL SYSTEMS). Miniaturized devices for diagnosis and treatment of ophthalmological and oncological diseases.
- Computational Design of Nanomaterials and Devices. Nanostructures and multifunctional spintronic devices.
- Theoretical analysis and modeling of microfluidic devices
- Research and Development of New Techniques in Computational Mechanics for Nonlinear Analysis of Structures and Mechanisms
- Transport properties, structural and optical semiconductor thin film
- Polycrystalline Silicon Thin Films with Application to Solar Cells

Areas of Research

- Microfluidics
- Photoreactors – Contamination, Polymers and Polymerization Reactors
- Synthesis and Optimization of processes- Expert Systems
- Rheology and Transport Phenomena of Natural and Synthetic Polymers
- Fluid Flow and Interfacial Dynamics
- Food and Biotechnology, Biosystems Contamination
- Physics of Semiconductor
- Solar Photovoltaic energy
- Solar Cells Modeling and Optical Detectors
- Computational Materials
- Computational Modeling of Nanomaterials
- Simulation methods in fluid mechanics
- Simulation methods in fluid-structure coupling
- Simulation methods on solids and mechanisms

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MICROREACTORS

Chemical Engineering Pilot Plant

PLAPIQUI, acronym for "Planta Piloto de Ingeniería Química"

National Southern University

General research topics

- Analysis and optimization of chemical reactors
- Study of structured catalytic reactors
- Study of structured catalytic reactors and of membrane

Areas of Research

- Reactions Engineering and Particle Technology: analysis of reaction mechanisms; simulation and optimization of industrial reactors; study of catalytic membrane reactors for hydrogen generation; simulation of demo balances and granulation circuits for the study of fluid **Lecho** granulator.
- Food Engineering: study of processes and equipment by means of which it produces physical and chemical processing of natural plant products to improve its organoleptic and nutritional quality and ease consumer's use.
- Catalysis: "'research and development activity includes the preparation, characterization and evaluation of a wide range of catalytic materials and catalysts of general interest, particularly in the chemical and petrochemical industries
- Science and Polymer Technology: carries out research and education in almost all branches of science and technology of plastic materials: polymerization processes, properties, characterization and processing.
- Thermodynamics of process: studied the separation processes in the petrochemical and gas industry, the recovery of natural products, applying the thermodynamic modeling, the molecular design of solvents, the balance between phases.

OPTICS

Institute of Technological Development for the Chemical Industry
INTEC, acronym for "Instituto de Tecnología para la Industria Química"
National University of the Litoral

General research topics

- Electro-optical properties of micro semiconductor and nanocrystalline
- Transport properties, structural and optical semiconductor on thin film
- Polycrystalline Silicon Thin Films with Application on Solar Cells

Areas of Research

- Semiconductor Physics. Photovoltaic Solar Energy
- Solar Cells Modeling and Optical Detectors

OPTICS

Physics Institute Enrique Gaviola
National University of Cordoba

General research topics

- Study and characterization of polymers, glassy crystals, porous materials pharmaceuticals and nanomaterials through NMR and RCN techniques
- Research techniques and instrumentation in experimental techniques of nuclear magnetic resonance
- Quantum Mechanics of the temporal evolution of NMR signals and coherence
- Magnetism and magnetic materials. Development, structural characterization and magnetic of the nanostructured materials
- Atmospheric electricity
- quantum Systems of few bodies: applications to atomic and molecular physics
- Interaction of radiation with matter. X-ray fluorescence Electron probe microanalysis. Inelastic scattering X-ray
- Spectroscopy temporal tomography. Unconventional analysis by XRF
- X-ray spectroscopy and applications to Medical Physics.
- Dynamics of complex systems: vortices in superconductors, domain walls in ferromagnetic systems, gels, fractures.

MANUFACTURE – TREATMENT OF NANOSTRUCTURES

Applied and Theoretical Physicochemical Research Institute

INIFTA, acronym for "Instituto de Investigaciones Físico-Químicas Teóricas y Aplicadas"

National University of La Plata

General Research Topic

- Nanofabrication methods.
- Modification of surfaces at a nano-micro scale applied to biomedical technologies.

Research Lines

- Use of molecular films (alkanethiolates, silanes) as non-stick layers for high resolution moulding and replication of hard material, such as metals, alloys, and ceramics. The technology is based on deposition (electrodeposition, physical vapour deposition, laser ablation, etc) of self-assembled monolayers of alkanethiols or silanes.
- Modification of surfaces with adsorbed molecules (thiols, proteins, etc.) or generation of surfaces on which micro-/nano-patterns are generated to enhance medical devices.

Examples of Developments

- Nano-/micro-scale order affects the early stages of biofilm formation on metallic surfaces.
- Moulding and replication of ceramic surfaces with resolution at the nano-scale.

Fields of Application

- Nano-materials.

Contact

Patricia Schilardi, PhD

MANUFACTURE – TREATMENT OF NANOSTRUCTURES

Chemistry Department. Physico-Chemistry and Life Sciences School.
National University of Río Cuarto.

General Research Topic

- Development of micro-/nano-materials and hierarchical structures. Synthesis and new techniques for characterization.

Research Lines

- Advanced materials: Polymers, carbon, nanoparticles, carbon nanotubes.
- Polymer electrochemistry.
- Combinatorial chemistry of conductive polymers.
- Functionalisation of carbon nanotubes.
- Photolithography. Printing of direct laser interference patterning.
- Conductive polymer-based smart nanoparticles.

Examples of Developments

- Smart surfaces: Reversible switching of a polymeric hydrogel topography of poly(N-*isopropylacrylamide*) by applying a direct laser interference patterning printing technique.
- Design of a new electrogenerated polyquinone film substituted with glutathione for its use in direct electrochemical biosensors for detecting DNA hybridisation in 50 nM concentrations.
- Synthesis, properties, and applications of conductive polymer nano-objects. The successful introduction of polyaniline nanofibres in cancer cell lines suggests that they may be used for absorbing NIR radiation in photothermal or photoacoustic therapies of tumours and/or in CAT scans.
- Manufacture of highly ordered matrices of platinum nanoparticles using methods for generating direct laser interference patterning.

Fields of Application

- Diagnostics.
- Nanomaterials

Contact

César Barbero, PhD

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CATALYSIS

Chemical Engineering Pilot Plant

PLAPIQUI, acronym for "Planta Piloto de Ingeniería Química"

National Southern University

General Research Topics

- Processing of vegetable oils (extraction, degumming, hydrogenation, dissolventing).
- Enzymatic degumming.
- Development of monolithic catalysts with an anodised aluminium substrate applicable in oleochemistry.
- Biotechnological processes for a sustainable production of biofuels and products of interest, separation processes at chemical and waste treatment plants.

Research Lines

- Monoglyceride synthesis from glycerine by homogeneous, heterogeneous, or enzymatic catalysis.
- Lipase immobilisation in biopolymers, and in magnetite and biopolymer or polar polymer composites.
- Application of immobilised and autoimmobilised lipases in the synthesis of structured triglycerides, hydrolysis of triolein, and synthesis of heptyl oleate.
- Use of semiempirical calculation methods and molecular mechanics methods for modelling heterogeneous and enzymatic catalytic systems.
- Preparation of lipase self–supporting biocatalysts (CLEAs).

Examples of Developments

- HPHT (High Pressure and High Temperature) Technology for cracking water emulsions in petrol for environmental remediation.
- Modelling of a cryogenic plant.
- Energy integration of distillation columns.
- Thermal and mechanical design of shell and tube condensers.

Contact

María Ofelia García, Engineer

CATALYSIS

Centre for Research and Development of Industrial Fermentation

CINDEFI, acronym for "Centro de Investigación y Desarrollo en Fermentaciones Industriales"

National University of La Plata

General Research Topic

- Studies of biocatalysis in non–conventional mediums.

Research Lines

- Development of strategies for biomolecular purification.
- Scale–up to pilot plant level for the production of recombinant proteins.
- Biotransformation: Progress and applications in fermentation processes.
- Adaptation of Gram–positive bacteria to organic solvents (applications and potential).
- Analysis of technological trends in the area of biocatalysts.
- Controlled release of molecules.

Examples of Developments

- Process engineering in enzymes of technological interest.
- Development of microparticles in inorganic/biopolymer hybrids by fine chemistry and supercritical fluids.

Contact

Guillermo R. Castro, PhD

ORGANIC CHEMISTRY

Rosario Chemical Institute

IQUIR, acronym for "Instituto Química Rosario"

National University of Rosario

General Research Topic

- Organic chemistry.

Research Lines

- Dendrimers: Studies towards a synthesis of dendritic macromolecules. Study of optical and electrical properties.
- Development of biocatalytic strategies for the synthesis of optimally active composites. Production of chiral materials and analytical methods for the direct separation of enantiomers.
- Theoretical and experimental study on organoborane reactions.
- Rational synthesis and evaluation of relevant natural bioactive and analogue products, as well as new alternatives suitable for controlling pharmaceutical quality.
- Synthesis methodologies and strategies for generating molecular diversity and their application in the production of biologically promising structures.
- Polymers and macromolecules applied to the development of microparticles for transporting drugs and microorganisms.
- Synthetic sequences aimed at building polycyclic skeletons of biological interest.

Examples of Developments

- Synthesis and characterisation of dendritic molecules and evaluation of the optoelectronic properties of new organic materials, as well as their potential application in photovoltaic cells.
- Development of synthetic routes for producing composites of interest.
- A new environmentally friendly process which enables the production of phytosterols from steryl glucosides, taking advantage of waste products from the biodiesel industry to be used as raw material.

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ANALYTICAL CHEMISTRY

Rosario Chemical Institute

IQUIR, acronym for "Instituto Química Rosario"

National University of Rosario

General Research Topic

- Analytical chemistry.

Research Lines

- Development of electrochemical biosensors for determining in complex mediums: Applied to the clinical diagnosis of infections.
- Development of luminescent analytical methods combined with chemometric methods. Applied to environmental and food controls.
- Development of luminescent methods assisted by chemometry in solution, organised mediums, and solid phases. Applied to the analysis of environmentally relevant composites.
- Chemometric modelling of multivariate spectroscopic data.
- Development and optimisation of analytical methods for quantifying environmental chemical pollutants, based on high efficiency liquid chromatography and molecularly imprinted polymer optosensors with chemometric assistance.
- Study of biochemical profiles associated with organic acid and amino acid catabolism in lactic bacteria for industrial use.

Examples of Developments

- Development of new systems and technologies for the detection of environmental chemical pollutants, based on the use of an element of specific recognition, which may be biological or biomimetic.

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POLYMER SCIENCE AND ENGINEERING

Material Science and Technology Research Institute

INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"

National University of Mar del Plata

General Research Topic

- Modelling, synthesis, and characterisation of polymers and copolymers.

Research Lines

- Precision synthesis of polymers and copolymers.
- Molecular dynamics of polymer chains.
- Synthesis and characterisation of polymer films and coatings.
- Mass transport in polymer matrices.
- Micro-spectroscopic characterisation of material.
- Confocal Raman microscopy-based techniques.
- Modelling and experimental verification of expansion processes in thermoplastic polyolefins with supercritical fluids.
- Modelling and experimental verification of degradation processes in polyolefins.
- Elastomer bonding processes to polyolefins.
- Identification of properties for non-destructive testing.
- Evaluation and simulation of mechanical behaviour and damages of polymeric materials.
- Plastic tubing.
- Tribological properties.
- Performed indentation.
- Modelling of deformation of polymeric materials.
- Impact properties.
- Fracture mechanics.
- Nanometric characterisation of films and surfaces.
- Analysis of fracture behaviour in plastic products.
- Ductile–fragile transition.
- Simulation–based study and ascertainment of optimum production parameters for the manufacture by injection moulding of polymeric material parts.

Examples of Developments

- Technology for the production of expanded polyolefins for their use in insulation and packaging.

- Technology for the production of support material for their use in well fracturing for the production of oil and gas.

CONICET

POLYMER SCIENCE AND ENGINEERING

Chemical Engineering Pilot Plant

PLAPIQUI, acronym for "Planta Piloto de Ingeniería Química"

National Southern University

General Research Topics

- Optimisation and control of polymer processes.
- Synthesis and modification of polymers and copolymers.
- Natural and biodegradable polymers.
- Mixes, composites, and nanocomposites.

Research Lines

- Reactive modification of polymers and copolymers.
- Polymerisation reactors of interest to industry.
- Development of kinetic and probabilistic modelling of polymer systems.
- Development of methodologies for predicting molecular structure in polymerisation and modification processes of polymers and copolymers.
- Polymers of controlled structure.
- Copolymer block with controlled microstructure at a nanometric scale.
- Chemical and physical modification of polymers and copolymers for various post–reactor processes.
- Enhancement of polymer/fibre interfaces for in situ polymerisation.
- Synthesis and characterisation of natural and synthetic polymer mixes.
- Chemical production, characterisation, and modification of alginates.
- Chemical and physical modification of polyolefins by mixing biodegradable materials.
- Polymers for the controlled release of drugs.
- Treatment and processing of waste plastic material for recycling.
- Separation of thermoplastic polymer mixes by supercritical fluids.
- Production, characterisation, and evaluation of the properties of polyolefin-based mixes, composites, and nanocomposites.
- Development of controlled permeability films with active packaging applications.

POLYMER MATRIX COMPOSITE MATERIALS

Material Science and Technology Research Institute
INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"
National University of Mar del Plata

General Research Topic

- Design, processing, characterisation, and analysis of degradation in fibre-reinforced composite materials.

Research Lines

- Design, development, and characterisation of composite materials.
- Processing of composite materials.
- Nanocomposites.
- Service life of composite materials.
- Innovative products based on composite materials.
- Life–cycle assessment of composite materials.
- Non–destructive characterisation techniques applied to composite materials.

CONICET

NANOMATERIALS

Material Science and Technology Research Institute
INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"
National University of Mar del Plata

General Research Topics

- Study of techniques and methods of analysis related to functional nanostructured materials.
- Synthesis of functionalised nanoparticles, structured matrices at different levels, nanostructuring by processing, and theoretical simulation and characterisation methods.

Research Lines

- Nano– and microstructured polymer materials.
- Synthesis, characterisation, and properties of thermoreversible amphiphile gels.
- Dispersion of inorganic nanoparticles in polymer matrices.
- Micro– and nanostructured materials obtained by modifying a thermorigid matrix with copolymer blocks.
- Light dispersion modelling and other micro– and nanoparticle radiation.
- Synthesis and characterisation of bridged silsesquioxanes with luminiscent properties.
- Production of hydrogels by photopolymerisation as systems suitable for the controlled release of active principles.
- Generation of AZO materials with anisotropic optical behaviour.
- Fluoride polymers.
- Hierarchical mesoporous nanostructured materials.
- Thermodynamic modelling of phase equilibria in nanoparticle dispersions in liquid crystals.
- Dynamic simulation of phase transitions in liquid crystals dispersed in polymers.

Examples of Developments

- Photoluminescent materials, with shape memory.
- Dental materials.
- Films for various applications, such as antistatic and dielectric coatings, gas sensors, UV photodetection, tissue regeneration membranes.

BIOMEDICAL MATERIALS

Material Science and Technology Research Institute
INTEMA, acronym for "Instituto de Investigaciones en Ciencia y Tecnología de los Materiales"
National University of Mar del Plata

General Research Topic

- Study of the synthesis, characterisation, properties, processing, and applications of biomedical materials and devices of interest in tissue engineering and regenerative medicine.

Research Lines

- Synthesis, characterisation, and properties of aliphatic polyesters and copolymer blocks.
- Synthesis, characterisation, and properties of biodegradable linear and network polyurethanes.
- Polymer systems for tissue engineering: Preparation of high porosity matrices.
- Development of processing techniques and characterisation of porous matrices.
- Polymer and composite nanofibres with applications in tissue engineering and functional textiles.
- Release systems for drugs and active principles.
- Nanomedicine: Nanoencapsulation and nanotransporters.

Examples of Developments

- Design of polymer biomaterials for biomedical applications (synthesis, characterisation, properties, and processing).
- Development of acrylic–based surgical cement formulas with and without antibiotics.
- Synthesis of bioabsorbable polymers and polylactic acid microspheres, and development of bifunctional bone fillings with gentamycin.
- Moulding of segmented polyurethane parts for ventricular assistance devices.

BUILDING MATERIALS

Institute of Technology and Engineering Sciences "Ing. Hilario Fernández Long"
INTECIN, acronym for "Instituto de Tecnologías y Ciencias de la Ingeniería"
University of Buenos Aires

General Research Topics

- Durability of cement–based materials (Mortars and Concretes).
- Sustainability of concrete construction.
- Development and optimisation of special concretes (self–compacting concrete, lightweight concretes, shotcrete).
- Strength of materials and welding processes.

Research Lines

- Sustainability of concrete construction.
- Sustainability indicators of materials and products.
- Energy efficiency of buildings.
- Thermal inertia of concrete.
- Characterisation of concretes at the micro– and mesoscopic scales.
- Special concretes.
- Development of materials.
- Welding.

Examples of Development

- Study of adherence in glass fibre–reinforced polymer (GFRP) bars included in concrete.
    - Portland cement modified with polyvinyl alcohol and nano-montmorillonites.

Contact

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NANOTECHNOLOGY-POLYMERS

Institute of Polymer Technology and Nanotechnology

ITPN, acronym for "Instituto de Tecnología en Polímeros y Nanotecnología"

National University of Buenos Aires

General Research Topics

- Polymers
- Nanotechnology

Research Lines

- Biomaterials
- Biopolymers
- Biotechnology and biosynthesis
- Characterization and synthesis of nanostructured materials
- Polymers for oil and construction industries
- Mechanical properties and fracture
- Rheology

Examples of Development

- Bacterial nanocellulose
- Nanotechnology applied to construction materials
- Development of materials for shale/tight gas and oil
- Food additives
- Paints
- Carbon-dioxide capturing concrete nanoadditive

Contact

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