



## **PLENARY LECTURES**

### **Process intensification**

#### **Recent Advances in Energy-Based Intensification of Chemical Reactions: Can We Control Molecules Better?**

PL1

Andrzej Stankiewicz

### **Entrepreneurship and innovation**

PL2

Roger-Marc Nicoud

### **Energy and sustainability**

PL3

Wolfgang Arlt

### **Biopolymer-mediated intracellular transport for drug delivery and human cell cryopreservation**

PL4

Nigel Slater

### **Forest based biorefineries: Role of catalysis and reaction engineering**

PL5

Dmitry Yu. Murzin

### **New Models in Engineering Education**

ST

Sebastião Feyer de Azevedo

## **KEYNOTE PRESENTATIONS**

**The two alternative mechanisms of catalytic carbon formation – relevance of kinetic linearity, surface duality and nano-geometry**

KN1-CM

L. Sousa Lobo

**Mechanism of Catalytic Carbon gasification: Chemical Engineering at Nano Scale. The case of CO<sub>2</sub> with Fe, Cu, Mg, V and their Alloys**

KN1-CM part II

L. Sousa Lobo, S.A.C. Carabineiro

**Molecular Simulation as a Prediction and Design Tool in Chemical Engineering**

KN2-MS

M. Jorge

**Towards zero energy buildings: photovoltaic and photoelectrochemical devices**

KN3-EN

A. Mendes

**Polymeric Biomaterials: Recent Developments**

KN4-BE

M.H. Gil, P. Alves, P. Coimbra, P. Ferreira

**Bioengineering strategies for *ex-vivo* cultivation and purification of stem cells**

KN5-BE

J.M.S. Cabral

**The Emergence of Commercial Bio-Products – Development Program at Group Portucel**

KN6-BR&I

A. Gaspar, P. Sousa, J. Ataíde

## **ORAL SESSION - BIOLOGICAL ENGINEERING**

### **Membrane reactors in process intensification of mannosylerythritol lipids production from sugars**

O-BE1

M.V. Santos, N.T. Faria, C. Fonseca, F.C. Ferreira

### **Effect of Biopolymer Purification Process on the Properties of Exopolysaccharides Membranes for Pervaporation**

O-BE2

I.T. Meireles, C. Portugal, V.D. Alves, J.G. Crespo, I.M. Coelho

### **Packed bed enzyme microreactor: application in sucrose hydrolysis as proof-of-concept**

O-BE3

P. Fernandes, F. Carvalho

### **Development of Biofiller to Permeable Reactive Barriers for Treatment of Groundwater Polluted with Polycyclic Aromatic Hydrocarbons**

O-BE4

L. Ferreira, E. Rosales, M.A. Sanromán, M. Pazos

### **Development of New Disinfection Solutions Including the Use of Chemical Combinations**

O-BE5

A. Meireles, R. Fulgêncio, I. Machado, F. Mergulhão, L. Melo, M. Simões

### **Synthesis and Characterization of a Graphene-based Composite Photocatalyst Applied to the Photoinactivation of Microorganisms**

O-BE6

P. Magalhães, J. Ângelo, V.M. Sousa, O.C. Nunes, L. Andrade, A. Mendes,

### **Stability evaluation of polymer-liposome complexes for drug delivery systems prepared with bacterial lipids**

O-BE7

P. Alves, A.A. Hugo, E.E. Tymczyszyn, F. Szymanowski, P.F. Pérez, J.F.J. Coelho, P.N. Simões, A. Gómez-Zavaglia

### **Sustainable biosurfactants: Yeast conversion of lignocellulosic biomass into mannosylerythritol lipids**

O-BE8

N.T. Faria, M.V. Santos, C. Ferreira, S. Marques, F.C. Ferreira, C. Fonseca

### **Phenylboronic Acid Chromatography: Validation and Scale-up of a Multi-modal Process for the Purification of Monoclonal Antibodies**

O-BE9

S.A.S.L. Rosa, R. dos Santos, M. R. Aires-Barros, A. Tover, A.M. Azevedo

### **Scalable expansion of neural stem cells supported in electrospun nanofiber scaffolds**

O-BE10

M.C.A. Sousa, C.A.V. Rodrigues, J.M.S. Cabral, F.C. Ferreira

### **Enzyme Superactivity Induced by Ionic Liquids Aggregates as the Key for Boosting the Reactions Yield**

O-BE11

P. de Morais, L.D.F. Santos, F.A. e Silva, S.P.M. Ventura

**Detection and Discrimination of Microorganisms Using Locked Nucleic Acid - Fluorescence *In Situ* Hybridization (LNA-FISH)**

O-BE12

A.S. Azevedo, B. Pereira, C. Almeida, L. Melo, J. Wengel, N.F. Azevedo

**Yeasts identification in microfluidic devices through peptide nucleic acid fluorescence *in situ* hybridization (PNA-FISH)**

O-BE13

D. Moreira, L. Cerqueira, J. Miranda., N.F. Azevedo

**Extraction of Bovine Serum Albumin (BSA) by Aqueous Biphasic Systems (ABS) composed of Good's buffer ionic liquids**

O-BE14

M.V. Quental, M. Taha, F.A., Silva, S.P.M. Ventura, M.G. Freire, J.A.P. Coutinho

**Integral production and concentration of surfactin from *Bacillus* sp ITP-001 by semi-batch foam fractionation**

O-BE15

M.T.S. da Silva, C.M.F. Soares, A.S. Lima, C.C. Santana

**Bioethanol Production from Rockrose Pretreated by Steam Explosion**

O-BE16

A.M.R.B.Xavier, M.Ferro, A.F.C Paulino, J. Gravitis, D.V. Evtuguin, M.C. Fernandes

**Spray-drying of *Suillus luteus* and *Cropinopsis atramentaria* mushroom alcoholic extracts and its synergistic antioxidant effect**

O-BE17

A. Ribeiro, G. Ruphuy, L. Barros, J.C. Lopes, M.M. Dias, I.C.F.R. Ferreira, M.F. Barreiro

**ORAL SESSION - CHEMICAL ENGINEERING FUNDAMENTALS AND PRACTICE**

**Gallium-Substituted and Promoted Hydrotalcites for CO<sub>2</sub> Capture at High Temperatures: Sorption Equilibrium and Kinetics**

O-FP1

C.V. Miguel, R. Trujillano, V. Rives, M.A. Vicente, A.F.P. Ferreira, A.E. Rodrigues, A. Mendes, L.M. Madeira

**Adsorption Equilibria of CO<sub>2</sub> and N<sub>2</sub> on MIL-53(Al): Experimental Measurements and Adsorption Potential Theory Analysis**

O-FP2

B.C.R. Camacho, R.P.P.L. Ribeiro, I.A.A.C. Esteves, J.P.B. Mota

**Carbon dioxide removal from anaesthetic gas circuits using carbonic anhydrase and ionic liquid membranes**

O-FP3

C.F. Martins, L. A. Neves, C.A.M. Afonso, I.M. Coelho, J.G. Crespo

**Thermodynamic Analysis of Glycerol Steam Reforming for Hydrogen Production With in Situ Hydrogen and Carbon Dioxide Separation**

O-FP4

J.M. Silva, M.A. Soria, L.M. Madeira

**Implementation of a Simulated Moving Bed Reactor process for the synthesis of acetals: The Glycerol Ethyl Acetal case study**

O-FP5

R. Faria, C. Pereira, V. Silva, J. Loureiro, A.E. Rodrigues

**Purification of the Polyphenolic Fraction from *E. globulus* Bark Extract by Membrane and Adsorption Processes**

O-FP6

I. Mota, P.C. Pinto, C. Pereira, J. Loureiro, A.E. Rodrigues

**Optimization of the Adsorption Process for the Analytical and Preparative Separation of Nadolol Stereoisomers**

O-FP7

A.E. Ribeiro, A.E. Rodrigues, L.S. Pais

**Hydrogenation of Nitrobenzene over Pd/Al<sub>2</sub>O<sub>3</sub> catalyst – Mechanism and effect of the main operating conditions**

O-FP8

C. Sá Couto, L.M. Madeira, C.P. Nunes, P. Araújo

**Heterogeneous Photocatalytic Synthesis of p-Anisaldehyde from p-Methoxytoluene in a Small Batch Reactor under UV-LED Irradiation**

O-FP9

D. Heggo, H. Mohamed, S. Ookawara, Y. Matsushita

**An Analysis of Ceramic Catalysts Comprised by Iron and Cobalt Oxides for the Heterogeneous Fenton's Reaction**

O-FP10

A.F. Rossi, R.C. Martins, R.M. Quinta-Ferreira

**Mass-transfer in narrow rectangular channels with mesh-type spacers under pulsatile flow in laminar regime**

O-FP11

C. Rodrigues, V. Semião, V. Geraldes

**Electrochemical Impedance Spectroscopy Measurements During Chlorine-Evolution Reaction**

O-FP12

J.F. Silva, A.C. Dias, P. Araújo, C.M.A. Brett, A. Mendes

**On the selection of the working conditions to precipitate Polystyrene wastes from Limonene solutions**

O-FP13

C. Gutiérrez, J.F. Rodríguez, I. Gracia, A. de Lucas, M.T. García

**Systematic Parameter Estimation for Equilibria Data With Thermodynamic Consistency Metrics and Phase Stability**

O-FP14

J.F.O. Granjo, N.M.C. Oliveira, J.A.P. Coutinho

## **ORAL SESSION - CHEMICALS AND MATERIALS**

### **Effect of Finishing Methods on Fragrance Release of Functional Wool/Polyester Fabrics**

O-CM1

I.M. Martins, M.F. Barreiro, A.E. Rodrigues

### **Correlating Adsorption and Flocculation Kinetics of Polyelectrolytes with Different Architectures**

O-CM2

M. G. Rasteiro, I. Pinheiro, H. Ahmadloo, D. Hunkeler, F.A.P. Garcia, P. Ferreira and C. Wandrey

### **Effect of an Additive on the Permanent Memory Effect of Polymer Dispersed Liquid Crystal Films**

O-CM3

M.C. Silva, J. Sotomayor, J. Figueirinhas

### **Photopolymerized Polymethacrylate Resin for Thiocyanate/Phenol Separation**

O-CM4

A.M. López, A. Villa-Garcia, M. Rendueles, M. Díaz

### **Preparation of hydroxyapatite nanodispersions in the presence of chitosan**

O-CM5

G. Ruphuy, A. Saralegi, J.C.Lopes, M.M. Dias, M.F. Barreiro

### **The Alkalinity in Crosslinking of Hyaluronic Acid with Divinyl Sulphone Improves Properties of the Microparticles as Biomaterial**

O-CM6

M.H.A. Santana, A.A Shimojo

### **Production of RAFT Imprinted Smart Hydrogel Particles in a Continuous Flow Micro-reactor**

O-CM7

C. Machado, A. Freitas, P. Kadirvel, R.C.S. Dias, M.R.P.F.N. Costa

### **Continuous Production of high Quality Nanoparticles of Metal-Organic Frameworks**

O-CM8

M. Costa, C.M. Fonte, P. Horcajada, T. Devic, J. Faria, M.M. Dias, J.C.Lopes

### **Fatty Acid Derivatives: a New Approach to Develop Waterborne Paints With Low VOC emissions**

O-CM9

J.V. Barbosa , A. Mendes, F.D. Magalhães , M.M.S.M. Bastos

### **Rheological Behavior of Nonionic Surfactant-based Gels**

O-CM10

G.A.S. Nóbrega, D.A.A. Gomes, A.A. Dantas Neto, E.L. Barros Neto, T.N.C. Dantas

## **ORAL SESSION - EDUCATION AND SOCIETY**

### **Shaking up final oral evaluations: Poster-Karaoke in Chemical Engineering Laboratories**

O-ES1

A.B. Timmons, F.A. Da Silva

### **Evaluating the Effectiveness of Teaching Core Chemical Engineering Knowledge and Competencies in Higher Education – iTeach project**

O-ES2

J. Glassey, N. Kockman, V. Meshko, M. Polakovic, E. Schaer, L.M. Madeira

## **ORAL SESSION - ENERGY**

### **Production of hydrocracked lubricant base oils by the combination of units already existent in Galp Energia refineries**

O-EN1

P. Oliveira, A.R. Oliveira

### **A One-Dimensional and Two-Phase Flow Model of a Proton Exchange Membrane (PEM) Fuel Cell**

O-EN2

R.B. Ferreira, D.S. Falcão, V.B. Oliveira, A.M.F.R. Pinto

### **Preparation and optimization of transparent cuprous oxide photocathodes for allowing efficient solar water splitting**

O-EN3

P. Dias, M. Mayer, J. Azevedo, L. Andrade, A. Mendes, M. Graetzel, S.D. Tilley

### **Temperature Influence in the Recombination Reaction of Dye-Sensitized Solar Cells**

O-EN4

J. Maçaira, I. Mesquita, L. Andrade, A. Mendes

### **Power Generation by Reverse Electrodialysis: Directions for Future Development**

O-EN5

S. Pawlowski, V. Geraldes, J.P. Crespo, S. Velizarov

### **Production of renewable synthetic fuels from electricity using the ELECTROFUEL® concept**

O-EN6

J. Gomes, L. Guerra, J. Puna J. Rodrigues

### **Dairy industry effluent treatment and valorisation in a two chambered microbial fuel cell**

O-EN7

A. Faria, L. Gonçalves, J.M. Peixoto, L. Peixoto, A.G. Brito, G. Martins

### **Co-digestion of *Sargassum* sp. with glycerol and waste frying oil: optimization of the biomethane production using a design of experiments**

O-EN8

J.V. Oliveira, M.M. Alves, J.C. Costa

### **Anaerobic Studies of Ethylic and Methylic Biodiesel and Impact on Benzene Biodegradation.**

O-EN9

F.S. Portugal, A.S. Danko, J.M. Dias

### **Bioethanol Production From Sugar-rich Agro-Industrial Wastes**

O-EN10

A. Constantino, B. Rodrigues, S. Raposo, M.E. Lima-Costa

### **Glucose Fermentation to Hydrogen by Thermophilic Mixed Culture**

O-EN11

R.P. Ratti, T.P. Delforno, D.Y. Okada, M.B.A. Varesche

## **ORAL SESSION - MULTI-SCALE MODELING AND SIMULATION**

### **Modelling the Hydrodynamics of Cooling Channels Inside Shell-Type Power Transformers with CFD**

O-MS1

H.M.R. Campelo, R.T. Oliveira, C.M. Fonte, X.M. Lopez-Fernandez, M.M. Dias, J.C. Lopes

### **Dynamic Modelling Framework with Automatic Differentiation Index Reduction**

O-MS2

J.R. Leal, L.O. Santos, A. Romanenko

### **Stochastic modelling of the thermal and catalytic degradation of polyethylene**

O-MS3

N. Trindade, A. Lemos, A. Coelho, I.M. Fonseca, M.A.N.D.A. Lemos, F. Lemos

### **Kinetic Modelling for Enzymatic Hydrolysis of Pre-treated Sugarcane Straw**

O-MS4

J.D. Angarita, A.R. Secchi, E.C. Biscaia Jr., A.J.G. Cruz, R.B.A. Souza

### **MOF Based PSA Processes For Gas Separation**

O-MS5

A.M. Ribeiro, A.F.P. Ferreira, A.E. Rodrigues

### **Nanoscale Confinement of B-DNA into Hydrophobic Pores**

O-MS6

F.J.A.L. Cruz, J.J. de Pablo, J.P.B. Mota

### **Cyclone Optimization Using Particle Agglomeration**

O-MS7

A. Alves, J. Paiva, R. Salcedo

### **Study of Mass Transfer Limitations in a Multiphase Stirred Tank Reactor for the Screening of Shaped Catalysts**

O-MS8

C.P. Fonte, M. Braga, R. Vasile, L. Brunet-Errard, I. Pitault, S. Simoëns, C. De Bellefon, V. Santos-Moreau, J.C. Lopes

### **Synergistic effect of mixed solvents in extractive distillation to produce fuel alcohol**

O-MS9

I.D. Gil, L.C. García, G. Rodríguez

### **Monitoring the Process Correlated Structure Using Partial Correlation Information**

O-MS10

T. Rato, M. Reis

### **Evaluation of swirl strength and centrifugal acceleration on supersonic swirling separators**

O-MS11

B.M. Vaziri



## **ORAL SESSION - SUSTAINABILITY AND ENVIRONMENT**

### **Recovery of Cr(III) from tannery wastewaters using ion-exchange and nanofiltration** O-SE1

L. Gando-Ferreira, J.C. Marques, M.J. Quina

### **Sorption isotherms of recycled cellulosic fibres modified by ultra high pressure pre-treatment** O-SE2

A.M. Salgueiro, D.V. Evtuguin, J.A. Saraiva, F. Almeida

### **Analytical Performance of Spectral Deconvolution Approach for the Analysis of Diterpene Esters in Coffee Using HPLC-DAD** O-SE3

G.L. Erny, M. Moeenfar, A. Alves

### **Determination of the VOC removal capacity of a semi-continuous two-phase partitioning bioreactor** O-SE4

M. Guillerm, C. Picard, A. Couvert, A. Amrane, E. Dumont, E. Norrant, N. Lesage, F. Rouxel

### **Comparing Aerobic Granular Sludge and Flocculent Sequencing Batch Reactor Technologies for Textile Wastewater Treatment** O-SE5

N.D. Lourenço, R.D.G. Franca, M.A. Moreira, H.M. Pinheiro

### **Effect of Sequencing Batch Cycle Strategy on the Treatment of a Simulated Textile Wastewater with Aerobic Granular Sludge** O-SE6

A.M.T. Mata, H.M. Pinheiro, N.D. Lourenço

### **Evaluation of *Moringa oleifera* Seed Flour and Clays as Clarifying Agents of Eutrophic Lake Water** O-SE7

A.F.S. Santos, M. Rodrigues, J. Cardoso, A.C. Rodrigues, J.A.C. Teixeira, P.M.G. Paiva, L.C.B.B. Coelho, A.G. Brito, G. Martins

### **Microalgal Harvesting through Autoflocculation and Bioflocculation: an Overview** O-SE8

N.F.P. Silva, F.G. Martins, M.C.M. Alvim-Ferraz, V.J.P. Vilar, J.C.M. Pires

### **Life Cycle Assessment of Microalga Production using Domestic Wastewater and synthetic culture** O-SE9

M.S. Gonçalves, E. Castanheira, S. Graça, B. Ribeiro, L. Gouveia, A.C. Oliveira, F. Freire, C.T. Matos

### **Catalytic Studies for the Abatement of Emerging Contaminants by Ozonation** O-SE10

R.C. Martins, M. Cardoso, R.F. Dantas, C. Sans, S. Esplugas, R.M. Quinta-Ferreira

### **Orange II Dye Degradation by Heterogeneous Fenton Process in Continuous Stirred Tank Reactor** O-SE11

S. Queirós, C.S.D. Rodrigues, F.J. Maldonado-Hódar, L.M. Madeira

**Industrial Waste as Catalysts in electro-Fenton-like treatment: Activity, Stability and Reusability**

O-SE12

E. Alfaya, E. Rosales, M. Pazos, M.A. Sanromán

**Bromate Reduction Under Hydrogen Using Monometallic Catalysts on Different Supports**

O-SE13

J. Restivo, O.S.G.P. Soares, J.J.M. Órfão, M.F.R. Pereira

**A Biorefinery Based on Spent Coffee Grounds: a Waste to Chemicals and Energy Solution**

O-SE14

N. Caetano, V. Silva, A. Martins, T. Mata

**The Role of pH and Ionic Strength in the Sorption of Vegetable Oil from Water by Cork Granules**

O-SE15

A.M.A. Pintor, R.S. Souza, V.J.P. Vilar, C.M.S. Botelho, R.A.R. Boaventura

**Water vapour adsorption by a coffee-based microporous carbon: effect on CO<sub>2</sub> capture**

O-SE16

M.G. Plaza, A.S. González, F. Rubiera, C. Pevida

**An overview of eggshell waste potential for sorptive and catalytic processes**

O-SE17

M. Soares, M. Quina, R.M. Quinta-Ferreira

**POSTER SESSION - BIOLOGICAL ENGINEERING**

**Comparative study of *Candida guilliermondii* and *Pichia stipitis* fermentation on olive pruning dilute acid hemicellulosic hydrolysate**

P-BE1

J.G. Puentes, B.G. Fonseca, S. Mateo, I.C. Roberto, A.J. Moya, S. Sánchez

**Bioethanol Production: Adaptation of *Scheffersomyces stipitis* to Hardwood Spent Sulfite Liquor**

P-BE2

C.J.R. Frazão, S.R. Pereira, V. Sánchez i Nogué, L.S. Serafim, M.F. Gorwa-Grauslund, A.M.R.B. Xavier

**Characterisation of a Bacterium Isolated From a Minimally Processed Vegetables Plant Including its Antimicrobial Resistance**

P-BE3

A. Meireles, R. Fulgêncio, I. Machado, F. Mergulhão, L. Melo, M. Simões

**Bioflocculation Assessment of Mixed Cultures of Selected Microalgae and Cyanobacteria**

P-BE4

A.L. Gonçalves, J.A. Loureiro, J.C.M. Pires, M. Simões

**Immobilization of whole cells of *Yarrowia lipolytica* for citric acid production**

P-BE5

A. Gonçalves, A. Braga, P. Ferreira, I. Belo

**Development of An Image Analysis Methodology For Animal Cell Cultures Characterization**

P-BE6

A.L. Amaral, D.P. Mesquita, M. Xavier, L. Rodrigues, L. Kluskens, E.C. Ferreira

**Effect of Size and Oxidation in Biocompatibility of Graphene-based Materials**

P-BE8

A. Pinto, G. Carolina, D. Sousa, A. Moreira, I. Gonçalves, F. Magalhães

**Biorecovery of Heavy Metals Using Vermiculite for Sediment and Water Protection**

P-BE9

C. Ferronato, B. Silva, F. Costa, L.V. Antisari, T. Tavares

**Sucrose hydrolysis by immobilized invertase in Duolite A-568 employing a packed bed reactor**

P-BE10

B.V. Cabral, L.N.S.S. Falleiros, T.S. Carmo, L.D.S. Marquez, M.M. Resende, V.L. Cardoso, E.J. Ribeiro

**Use of Hardwood Sulphite Spent Liquor For Polyhydroxyalkanoate Production By Mixed Microbial Culture**

P-BE11

D. Queirós, A. Fonseca, C. Rangel, S. Rossetti, L.S. Serafim

**Fermentation in Two Operation Scales of Enzymatic Hydrolysates of Industrial Lignocellulosic Materials for the Production of Bioethanol**

P-BE12

C.V.T. Mendes, M.G.V.S. Carvalho, J.M.S. Rocha

**Influence of Different Photoperiods on Growth of the green microalgae *Chromochloris zofingiensis***

P-BE13

C. Silva, N. Caetano, A. Mendes

**Study of the encapsulation efficiency and release profiles of alginate microspheres containing  $\alpha$ -tocopherol**

P-BE14

D. Vieira, J.S. Amaral, M.F. Barreiro

**Game *tabulae* at the Convento de Cristo in Tomar – study of biological colonization**

P-BE15

D.M.R. Mateus, S. da Ponte, J.P.F. Coroado, F.J.F.T. Rocha

**Study of Ni (II) and Diethylketone Removal from Aqueous Solutions Using a Biofilm of *Streptococcus equisimilis* Supported on Vermiculite**

P-BE16

F. Costa, B. Silva, C. Quintelas, T. Tavares

**Effects of the Temperature and Broth Composition on Ethanol Production from Sugarcane Bagasse and Crude Enzymatic Extract**

P-BE17

J. Fischer, V. dos S. Lopes, E.F.Q. Santos, E.J. Ribeiro, U.C. Filho, V.L. Cardoso, C.M.A. Galvão, J.C. Teodoro

**Ethanol production via crude enzymatic hydrolysis of sweet sorghum bagasse treated with a pressurized batch hot water reactor**

P-BE18

J. Fischer, E.F.Q. Santos, V. dos S. Lopes, E.J. Ribeiro, U.C. Filho, V.L. Cardoso

**Effect of Edible Composite Coatings on Color Change in Tomato (*Solanumlycopersicum* L.) Fruits during Storage**

P-BE19

A.R.M. Barreto, E.M.M. Aroucha, F.K.G. Santos, R.H.L. Leite, T.A. Oliveira

**Poly(3-hydroxybutyrate) production by *Cupriavidus necator* DSM 545, from a byproduct of the ethanol production process**

P-B20

K. Zanfonato, L.K. Quines, M. Schmidt, C.S. Gai, F.M. Martinhago, W. Schmidell, G.M.F. Aragão

**Exploring the Use of Heparin as First Capture Step in the Purification of Monoclonal Antibodies from Cell Culture Supernatants**

P-BE21

I.F. Pinto, S.A.S.L. Rosa, M.R. Aires-Barros, A.M. Azevedo

**Screening of different microorganisms for their biodegradation capacity regarding polyester-based thermoplastic polyurethanes**

P-BE22

I.P. Fernandes, M. Barbosa, J.S. Amaral, V. Pinto, M.J. Ferreira, M.F. Barreiro

**Development of a prototype to access biodegradability of TPU shoe soles under controlled conditions**

P-BE23

I.P. Fernandes, M. Barbosa, J.S. Amaral, V. Pinto, M.J. Ferreira, M.F. Barreiro

**Covalent immobilization of crosslinked trypsin onto electrospun poly(ethylene terephthalate)/poly(lactic acid) nanofiber mats**

P-BE24

T.R. Silva, J.M.S. Rocha, M.H. Gil, S.C.S. Pinto, J.A. Lopes da Silva, A.J. Guiomar

**Optimization Of Initial Moisture And Temperature In Solid State Fermentation To Produce Cellulases By *Aspergillus Uvarum* On Olive Mill And Winery Wastes**

P-BE25

J.M. Salgado, L. Abrunhosa, J.M. Domínguez, A. Venâncio, I. Belo

**Cellulase and Xylanase Production by *A. uvarum* in Solid-State Fementation Using a Packed-Bed Bioreactor**

P-BE26

J.M. Salgado, L. Abrunhosa, J.M. Domínguez, A. Venâncio, I. Belo

**MSAT Strategies in Pharmaceutical Engineering**

P-BE27

T.A. Carvalho, A.J. Almeida, R.S. Gaspar, J.C. Menezes

**Biodegradation of chlorpyrifos, malathion and methyl parathion using a Compost - Soil matrix enriched with nutrients.**

P-BE28

S.A. Upegui, J.F. Saldarriaga, L. Botero

**A Study of Contamination Control in Ethanol Fermentation using Flocculent Yeast Cells**

P-BE29

L.D. Santos, C.Z. Guidini, M.M. Resende, V.L. Cardoso, E.J. Ribeiro

**Effect of temperature, pH and agitation on flocculent characteristics of *Saccharomyces cerevisiae* strains**

P-BE30

L.D. Santos, C.Z. Guidini, M.M. Resende, V.L. Cardoso, E.J. Ribeiro

**Production of Novel Monoclonal Antibodies Against Extracellular Polysaccharides from *Pleurotus ostreatus* by Using Hybridoma Technology**

P-BE31

M. Semedo, S. Martins, A. Karmali, L. Fonseca

**Novel Colorimetric Assay of Polysaccharides by Alcian Blue Dye in a 96-Well Microtiter Plate in Basidiomycete Mushrooms**

P-BE32

M. Semedo, L. Fonseca, A. Karmali

**Effect of the substitution of amine groups of PIL in the synthesis of silica and use in the immobilization of lipase**

P-BE33

M.V.S. Oliveira, P.A.A. Rodrigues, N.B. Carvalho, M.M. Pereira, S. Mattedi, C.M.F. Soares, A.S. Lima

**Bioactivity evaluation of four technical lignins: Alcell, Indulin-AT, Sarkanda and Curan 27-11P**

P-BE34

A. Marques, C.A. Cateto, R. Calhelha, L. Barros, M.J.R.P. Queiroz, M.N. Belgacem, A.E. Rodrigues, I.C.F.R. Ferreira, M.F. Barreiro

**Kefir and Probiotic Drinks Produced from Liquid Whey Protein Concentrate**

P-BE35

M. Henriques, D. Gomes, C. Pereira

**Biological removal of Cr (VI) with reuse of cells**

P-BE36

M.T. Natália, L.C. Vicelma, M.R. Miriam, J.R. Eloísio

**Immobilization of lipase in silica with ionic liquid, characterization and application for the ethyl esters syntheses**

P-BE37

N.B. Carvalho, B.T. Vidal, A.C. Professor, M.V.S. Oliveira, M. Pereira, S. Mattedi, L.S. Freitas, A.S. Lima, C.M.F. Soares

**Economic Viability of Biodiesel Produced from *Chlorella vulgaris* Oil: Impact of the Harvesting Step**

P-BE38

N. Caetano, T. Ribeiro, L. Ribeiro, C. Silva, T. Mata

**Insecticidal Activity of *Myracrodruon urundeuva* Leaf Lectin against *Sitophilus zeamais***

P-BE39

E.V. Pontual, B.R. Belmonte, L.P. Albuquerque, C.A.A. Rocha-Filho, R.A. Sá, R.M.S. Araújo, L.M. Paiva, L.C.B.B. Coelho, T.H. Napoleão, P.M.G. Paiva

**Phenylboronic Acid as an Alternative Ligand for Monoclonal Antibodies Capture: Optimization of a washing step**

P-BE40

R. dos Santos, S.A.S.L. Rosa, M.R. Aires-Barros, A.M. Azevedo

**Immobilization of Peroxidase on Functionalized Carbon Nanotubes for the Synthesis of High Performance Biocat**

P-BE41

R.M. Azevedo, J.B. Costa, C.G. Silva, A.P.M. Tavares, J.M. Loureiro, J.L. Faria

**Laccase Immobilization over Magnetized Multi-Walled Carbon Nanotubes for Biocatalysis Applicati**

P-BE42

J.B. Costa, R.M. Azevedo, C.G. Silva, A.P.M. Tavares, J.M. Loureiro, J.L. Faria

**Aerobic Granular Sludge Reactivation Performance in an Anaerobic-Aerobic Sequencing Batch Reactor After Long-term Storage**

P-BE43

R.D.G. Franca, H.M. Pinheiro, N.D. Lourenço

**Optimization of peptide nucleic acid fluorescence *in situ* hybridization (PNA-FISH) method for the detection of bacteria: the effect of pH, dextran sulfate and probe concentration**

P-BE44

R. Rocha, R. Santos, P. Madureira, C. Almeida, N.F. Azevedo

**Partial Molar Volumes of Glycine and L-Alanine in Aqueous MgSO<sub>4</sub> Solutions between 278.15 and 308.15 K**

P-BE45

C.C. Mota, O. Ferreira, S. Pinho

**Improvement of the Upflow Anaerobic Sludge Blanket reactor performance for azo dye reduction by the presence of low amounts of Activated Carbon**

P-BE46

R.A. Pereira, M.F.R. Pereira, M. Alves, L. Pereira

**Using *Paecilomyces variotii* in a biorefinery concept to produce single-cell protein and bioethanol from hardwood spent sulphite liquor**

P-BE47

T.M. Henriques, S.R. Pereira, L.S. Serafim, A.M.R.B. Xavier

**High-resolution Crystal Structure Of *Colocasia esculenta* Lectin**

P-BE48

P.R. Pereira, J.L. Meagher, I.J. Goldstein, V.M.F. Paschoalin, J.T. Silva, J.A. Stuckey

**Determination of Native Molecular Mass and Isoforms Detection of Tarin, The GNA-related Lectin From *Colocasia esculenta***

P-BE49

P.R. Pereira, H.C. Winter, M.A. Vericimo, J.L. Meagher, J.A. Stuckey, I.J. Goldstein, V.M.F. Paschoalin, J.T. Silva

**Obtaining Bacterial Cellulose Membranes with Added Starch Acetate**

P-BE50

V.C.R. Schmidt, F. Berti, L.M. Porto, J.B. Laurindo

***Geotrichum candidum* lipase purification using alcohol/salt-based aqueous two-phase systems**

P-BE51

W.G. Morais Jr, E.J. Ribeiro, M.M. Resende

**Immobilization and Stabilization of  $\beta$ -galactosidase on Duolite A568 by Multipoint Attachment**

P-BE52

L.N.S.S. Falleiros, W.G. Morais Júnior, B.V. Cabral, L.D. Santos, M.M. Resende, V.L. Cardoso, E.J. Ribeiro

**Granulated Industrial Cork and Cork Powder as Sources of High Added-Value Chemicals**

P-BE53

Y.A. Manrique, M.V. Oliveira, P. Pinto, J.M. Loureiro

**POSTER SESSION - CHEMICAL ENGINEERING FUNDAMENTALS AND PRACTICE**

**G<sup>E</sup> model and optimization method combinations for prediction of vapor composition in binary vle from T-x data**

P-FP1

A.R. Prasad, J.S. Babji, A.A. Kumar

**A comparative study on mixing rule and alpha-function combinations for correlation of binary vapor liquid equilibrium data by equation of state**

P-FP2

A.R. Prasad, J.S. Babji, A.A. Kumar

**Design Of Hydrogel Membranes With Embedded Magnetic Particles**

P-FP3

A.C. Manjua, F.V. Chávez, P.J. Sebastião, J.G. Crespo, C.A.M. Portugal

**Separation Of Human Immunoglobulin G Subclasses Using Monolith Technology**

P-FP4

P. Leblebici, M.E. Leblebici, F. Ferreira-da-Silva, A.E. Ribeiro, A.E. Rodrigues, L.S. Pais

**Microprotect project -The use of encapsulated essential oils for protection of stored cereals and legumes**

P-FP5

C.F.Silva, J.M.Sousa, F.D.Magalhães, M.M.S.M.Bastos

**Analysis of Internal Variables of a Distillation Column Operating with Distributed Control**

P-FP6

G.N. Mello, R.A.F. Machado, C. Marangoni,

**Catalysts Screening for the Reaction of Nitrobenzene Hydrogenation**

P-FP7

C. Sá Couto, L.M. Madeira, C.P. Nunes, P. Araújo

**Simultaneous Removal of CO<sub>2</sub> and VOC using a Two Phase Partitioning Reactor**

P-FP8

A. Couvert, D. Gómez-Díaz, D. López-Rivas, J.M. Navaza

**CO<sub>2</sub> Absorption by Primary Amines: Effect of Chemical Structure and Loading upon Reaction Pathway**

P-FP9

A. García-Abuín, D. Gómez-Díaz, D. López-Rivas, J.M. Navaza, A. Rumbo

**Synthesis and Characterization of  $\text{ALPO}_4$ -17 and Evaluation of the Diffusion of n-Paraffins C10-C13 by ZLC Technique.**

P-FP10

D.A.A. Gomes, S.Mattedi, M.M. Urbina, A.O.S.Silva, M. Bastos-Neto, L.A.M. Pontes

**Vinasse clarification by a combined treatment of coagulation/ flocculation and adsorption**

P-FP11

F.L Seixas, D.R.A. Okada, M.B. de Abreu, M.L. Menezes, S.H.B. de Faria, N.R.C. Fernandes-Machado, M.L. Gimenes

**Selective Extraction of (Bio)molecules by Applying Novel Aqueous Micellar Two-Phase Systems Composed of Triton X-114 and Ionic Liquids as Co-surfactants**

P-FP12

F.A. Vicente, L.P. Malpiedi, A.P. Junior, J.A.P. Coutinho, S.P.M. Ventura

**Adsorption of Vanillin and Syringaldehyde by Polymeric Resins: Equilibrium adsorption studies**

P-FP13

I. Mota, P.C. Pinto, J.M. Loureiro, A.E. Rodrigues

**Influence of ionic liquids as electrolytes in polymer-polymer aqueous biphasic systems**

P-FP14

J.H. Santos, J.A.P. Coutinho, A.Pessoa Jr., S.P.M. Ventura

**Chemometrics to Study the Ferric Sulphate Leaching of a Portuguese Sphalerite Concentrate**

P-FP15

S.M.C. Santos, M.T.A. Reis, M.R.C. Ismael, M.J.N. Correia, J.M.R. Carvalho

**Monitoring a Polyesterification Reaction by in-line Near-Infrared Spectroscopy**

P-FP16

H.I. Mota, M.J.N. Correia, J.C.M. Bordado

**A Comparison Study of Single-Scale and Multiscale Approaches for Data-Driven and Model-Based On-line Denois**

P-FP17

R.R. Rendall, M.S. Reis

**Potential use of chestnut (*Castanea sativa* M.) husk ashes as a source for potash production**

P-FP18

M.D. Torres, J. Seijo

**Mechanical Properties of Natural Potassium Soaps Obtained of By-products from the Chestnut Industry**

P-FP19

M.D. Torres, J. Seijo

**Fiber flow velocity estimation using Electrical Impedance Tomography**

P-FP20

P.M. Faia, B. Branco, F. Garcia, M.G. Rasteiro

**Production of chitosan microparticles cross-linked with genipin for drug release applications: A DoE approach to identify factors influencing size and shape properties**

P-FP21

M.J. Moura, S.P. Martins, B.P.M. Duarte



**Configuration characteristics of draft tube conical spouted bed dryer for biomass treatment**

P-FP22

M.J. San José, S. Alvarez, I. García

**Measurements of Activity Coefficients at Infinite Dilution for Terpenes, Terpenoids and Water in Ionic Liquids**

P-FP23

M.A.R. Martins, U. Domańska, B. Schröder, S.P. Pinho, J.A.P. Coutinho

**Alkylimidazolium Based Ionic Liquids: Mutual Solubilities and Thermophysical Properties**

P-FP24

M.A.R. Martins, C.M.S.S. Neves, K.A. Kurnia, L.M.N.B.F. Santos, M.G. Freire, S.P. Pinho, J.A.P. Coutinho

**Degradation of BDE-100 in waters by direct photolysis at ppb level**

P-FP25

M.S.F. Santos, A. Alves, L.M. Madeira

**Systematic development of kinetic models for systems described by linear reaction schemes**

P-FP26

C.S. Vertis, N.M.C. Oliveira, F.P.M. Bernardo

**Can the Odor Intensity be Predicted by a Theoretical Model?**

P-FP27

P. Costa, M.A. Teixeira, A.E. Rodrigues

**The Effect of the Spreading Coefficient on Oxygen Mass Transfer in Gas-Liquid-Liquid systems**

P-FP28

H. Pinho, H. David, S. Alves

**Recovery of Copper from Sulphuric Solutions Using Hollow Fibre Liquid Membrane Processes**

P-FP29

S. Agarwal, M.T.A. Reis, M.R.C. Ismael, J.M.R. Carvalho

**Magnetic Classification in wet mode: Proving the concept**

P-FP30

P.A. Augusto, T. Castelo-Grande, A.M. Estévez, M.A. Alves, P. Costa, D. Barbosa, M.C. Torrente

**POSTER SESSION – CHEMICALS AND MATERIALS**

**A Calixarene-derived Poly(phenyleneethynylene) as a Thin Film Sensor for High Explosives in Aqueous Media**

P-CM1

A.I. Costa, J.V. Prata

**Development of Uniform Chitosan ultrathin films on Glass and Silicon Substrates**

P-CM3

A.P. Carapeto, A.M. Ferraria, A.M. Botelho do Rego

**Effect of Nd Doping on The Binary Perovskite Transformation in  $\text{BaCe}_{1-x}\text{Nd}_x\text{O}_3$  ( $0 \leq x \leq 0.3$ )**

P-CM4

M.F. Lobato, A.G. Santos, F.K.G. Santos, C.P. Souza

**Substitution of Citric Acid by Oxalic Acid in Obtaining BaCeO<sub>3</sub> by a Combined EDTA and Citrate Complexing Method**

P-CM5

A.G. Santos, F.K.G. Santos, M.F. Lobato, C.P. Souza

**Low Density Polyester Particles As Lightfillers For Wood-based Panels**

P-CM6

Â. Dias, J. Ferra, J. Martins, L. Carvalho, F.D. Magalhães

**System researches in obtaining and analysis of the high purity materials**

P-CM7

A. Bessarabov, V. Trokhin, L. Trynkina, A. Vendilo

**Oligomerization of Glycerol Trough Basic Homogeneous and Heterogeneous Catalysts**

P-CM8

M. Matos, N. Gama, R. Silva, A. Barros-Timmons, A. Silvestre, A. Ferreira

**Assessing lignin characteristics with impact on performance towards vanillin and syringaldehyde production**

P-CM9

C.A Costa, P.C.R Pinto, A.E. Rodrigues

**NMR Characterization of Lignins from Kraft Mill Residues as a Prior Step for their Valorization**

P-CM10

C. Fernández-Costas, S. Gouveia, M.A. Sanromán, D. Moldes

**Mechanical Reinforcement of Poly(lactic acid) with Graphene**

P-CM11

C. Gonçalves, A. Pinto, A. Machado, A. Moreira, F. Magalhães

**Development of Structured Acrylic Latexes for Decorative Paints**

P-CM12

C. Ralheta, J. Moniz, A. Barros Timmons

**Experimental and simulation study of xylene isomers and toluene adsorption in metal organic frameworks (MOFs)**

P-CM13

C. Siquet, V.D. Martins, M.A. Granato, A.F.P. Ferreira, A.E. Rodrigues

**On the synthesis of niobium and tantalum mixed carbide nanostructured and characterization from based mineral columbite**

P-CM14

C.M. Barbosa, M.V.M. Souto, M.J.S. Lima, C.P.de Souza, U.U. Gomes

**Oxidized Xanthan Gum Cross-linked with Chitosan as Adhesive for Cork**

P-CM15

D. Paiva, M.M.S.M. Bastos, F.D. Magalhães

**Autohydrolysis as a sustainable alternative for the upgrade of sugarcane straw**

P-CM16

P.L. Martins, L.F. Pardo, J.E.L. Galán, A. Ferrer, L.C. Duarte, F.M. Gírio, F. Carvalheiro

**Selective Fractionation of Corn Straw Hemicellulose Using Iron Nitrate**

P-CM17

N. Santos, P. Moniz, L.C. Duarte, F. Carvalheiro

**Integrated Recovery of Lignin and Hemicellulose Derived Compounds from Rice Straw**

P-CM18

P. Moniz, L.C. Duarte, C. Serralheiro, L.B. Roseiro, H. Pereira, F. Carvalheiro

**Oligosaccharides production from *Annona cherimola* Mill. seeds: optimization and modelling**

P-CM19

A.M. Dionísio, P.C. Branco, I. Torrado, L.B. Roseiro, F. Carvalheiro, P.C. Castilho, L.C. Duarte

**Influence of Bentonite Clay Concentration and Additives on the Filtrate Volume and Cake Thickness on Water-based Drilling Fluids**

P-CM20

F.K.G. Santos, G.A.S. Nóbrega, J.L.B. Oliveira, D.A.A. Gomes

**Effect of glycerol plasticizer on chitosan physical properties and its application to chitosan nanoparticles-based biofilms production.**

P-CM21

M.Y. Fukumori, H.K.S. Souza, M.P. Gonçalves

**Biotechnological conversion of citrus molasses into poly (3-hydroxybutyrate)**

P-CM22

J.L. Ienczak, A.A de Melo, F. Dalcanton, M.L. Fiorese, W. Schmidell, G.M.F. de Aragão

**Monitoring the Isolation of Ptaquiloside, a Natural Carcinogen From Bracken (*Pteridium* spp.)**

P-CM23

J.P. Caçador, R.M. Gil da Costa, M.M.S.M. Bastos

**Characterization of Controlled Release Systems: Encapsulated Orange Oil**

P-CM24

J.V. Barbosa, F. Martins, C.F. Silva, J.M. Sousa, F.D. Magalhães, M.M.S.M. Bastos

**Selective and Sustainable Oxidation of Cyclohexane Catalyzed by Co-doped SnO<sub>2</sub> Nanoparticles under Mild Conditions**

P-CM25

T.F.S. Silva, L.M.D.R.S. Martins, R. Nunes, O.C. Monteiro, A.J. Silvestre, A.J.L. Pombeiro

**Electrochemical Magnetoassay for the Detection of Genetically Engineered Soybean**

P-CM26

C.L. Manzanares, M.F. Barroso, I. Mafra, J. Costa, N. de-los-Santos-Álvarez, M.J.L. Castañón, B. López-Ruiz, M.B.P.P. Oliveira, C. Delerue-Matos

**Gold nanoparticles synthesis using sodium borohydride and sodium citrate: A comparative study**

P-CM27

D. Cruz, M.F. Barroso, C. Delerue-Matos, J.R. Santos-Junior, R. Fonseca

**Oxidation of VOCs in outdoor air catalysed by cellulose/silica supported molybdovanadophosphates [PMo<sub>12-x</sub>V<sub>x</sub>]<sup>(3+x)</sup>- (x=1,2)**

P-CM28

M.C. Loureiro, M. Evtugina, J.A.F. Gamelas, I. Portugal, D.V. Evtuguin

**Healing Activity Induced by Glucose/Mannose Lectins in Mice**

P-CM29

C.M.L. Melo, V.P. Brustein, A.F.M. Vaz, C.C.B. Cavalcanti, P.M.G. Paiva, J.A. Teixeira, L.C.B.B. Coelho, M.G. Carneiro-da-Cunha, A.M.A. Carneiro-Leão, M.T.S. Correia

**Studies of sesquiterpene lactones with potential antitumoral activity: purification, characterization and synthesis of aminoderivatives**

P-CM30

M.J.C. Fachada, J.V. Barbosa, R.M. Gil da Costa, D.C.G.A. Pinto, A.M.S. Silva, M.M.S.M. Bastos

**Cafestol and Kahweol Content in Espresso Coffees as Influenced by Preparation Parameters**

P-CM31

M. Moeenfar, J.A. Silva, N. Borges, A. Santos, A. Alves

**Evaluation of Chlorogenic Acids in Coffee Brews Prepared by Recent Technologies**

P-CM32

M. Moeenfar, L. Rocha, A. Alves

**Effect of Doping On The Photocatalytic Activity of TiO<sub>2</sub> Nanowires Prepared By the Hydrothermal Method**

P-CM33

M.O. Honório, R.F.P.M. Moreira, A. Mendes, L. Andrade

**Evaluation of the total antioxidant capacity of vegetables by using optical conventional methods and a DNA-based biosensor**

P-CM34

S. Costa, M.S.B. Gonçalves, M. Rodrigues, M. Correia, A. Carvalho, M.J. Ramalhosa, M.F. Barroso, C. Delerue-Matos

**Assessment of the antioxidant capacity of juices using a DNA-based biosensor: Oxidative damage by radicals (a comparative study)**

P-CM35

D. Cruz, M.S.B. Gonçalves, M.F. Barroso

**Microencapsulation of Vitamin A by Spray-Drying Process**

P-CM36

M. Shahgol, B.N. Estevinho, F. Rocha

**Explosive Detection by Calix[4]arene-carbazole-containing Polymers**

P-CM37

P.D. Barata, J.V. Prata

**Development of a high affinity molecular imprinted polymer for the selective removal of 5-FU from contaminated waters**

P-CM39

P.E. Sá, M.S.F. Santos, A. Alves

**Carbon Nanotubes As Catalysts For Advanced Oxidation Processes: The Role of O, N and S Surface Groups**

P-CM40

R.P.Rocha, J. Restivo, A.M.T. Silva, J.J.M. Órfão, M.F.R. Pereira, J.L. Figueiredo

**Development of Stimuli-Responsive Smart Hydrogels using Molecular Imprinting and Interpenetrating Polymer Networks**

P-CM41

T. Oliveira, P. Reitor, D. Oliveira, P. Kadhivel, R.C.S. Dias, M.R.P.F.N. Costa

**Organic-inorganic sol-gel coating of paper surfaces for High Pressure Laminates**

P-CM42

S.P. Magina, D.V. Evtuguin, I. Portugal, J. Ferra, P. Cruz

**Separation and Concentration of Phenylglycine and Ampicillin through Packed-bed Adsorption**

P-CM43

M.F. Vieira, S.H.B. Faria, M. De Souza, R.C. Giordano, R.L.C. Giordano

**Silica-based nanocoating and modified xylan films for enhancement of paperboard barrier properties**

P-CM44

V.M. Dias, I. Portugal, A. Kuznetsova, J. Tedim, M. Zheludkevich, D.V. Evtuguin

**Synthesis of Organic Derivatives of Kaolinite. Characterization and Protein Adsorption Properties**

P-CM45

M.A. Villa-García, R. Duarte-Silva, M. Rendueles, M. Díaz

**Catalytic Wet Peroxide Oxidation of Olive Oil Mill Wastewater over Copper Bearing Zeolite Based Catalysts**

P-CM46

K.M. Valkaj, I. Polak, S. Islamović, D. Husanović, S. Zrnčević

**POSTER SESSION – ENERGY**

**Optimization of glycerol-organosolv pretreatment for improving enzymatic saccharification of Eucalyptus wood**

P-EN1

A. Romaní, H.A. Ruiz, F.B. Pereira, J.A. Teixeira, L. Domingues

**Use of whole-slurry from autohydrolyzed *Eucalyptus* wood for bioethanol production**

P-EN2

A. Romaní, H.A. Ruiz, F.B. Pereira, J.A. Teixeira, L. Domingues

**Biodiesel by Oil Methanolysis Over Sol-Gel Like VPO Catalysts: Bulk Versus Supported Catalysts**

P-EN3

C. Domingues, M.J.N. Correia, R. Carvalho, C. Henriques, J. Bordado, A.P.S. Dias

**Screening Yeasts Strains for Bioethanol Production Using Goat Cheese Whey as Raw Material**

P-EN4

C. Felizardo, B. Rodrigues, A. Constantino, T. Fernandes, D. Monteiro, F. Neves, L. Dionisio, S. Raposo, M.E. Lima-Costa

**Reactivation of Microbial Fuel Cell prototypes after a long shut down period**

P-EN5

A. Canavarro, V. Mendes, R.J. Barros

**A Kinetic Overview of Fermentative Performance of *Saccharomyces cerevisiae* Using Carob Industry Wastes as Carbon Source**

P-EN6

B. Rodrigues, A. Constantino, S. Raposo, J.M. Peinado, M.E. Lima-Costa

**Catalytic pyrolysis of biomass and residue of sisal fiber**

P-EN7

C.R de O. Félix, A.F. de A. Júnior, A.S. Silva, M.M. Albuquerque, C.A. Pires, V.T. Silva, S.T. Brandão

**Synthesis and Electrochemical Characterization of a New Ni@Pt Core-Shell Supported Nanocatalyst**

P-EN8

M.A. Esteves, A.I. de Sá, A. Capelo, L. Canguero, R. Vilar, C.M. Rangel

**Influence of Dry Mass Content from Pseudostem in Conversion of Cellulose to Glucose for Bioethanol Production**

P-EN9

P.K. Souza, O. Souza, N. Sellin, C. Marangoni

**VHG Fermentation using Goat Cheese Whey as Raw Material**

P-EN10

F. Neves, B. Rodrigues, A. Constantino, C. Felizardo, D. Monteiro, T. Fernandes, L. Dionisio, S. Raposo, M.E. Lima- Costa

**Co-gasification of Wastes Generated During Rice. Production in Portugal**

P-EN11

F. Pinto, R.N. André, M. Mirand, D. Neves

**Study of the effect of experimental conditions on co-pyrolysis of rice husk and plastics wastes**

P-EN12

P. Costa, F. Pinto, M. Miranda, M. Rodrigues

**Pretreatment of Lignocellulosic Materials as Biomass by Supercritical -CO<sub>2</sub> Explosion for Biofuel Production**

P-EN13

K.Y.F. Kawase, G.L.V. Coelho

**Hydrogen Generation From Catalytic Hydrolysis Of Sodium Borohydride On A Mini-Reactor For Portable Applications**

P-EN14

H.X. Nunes, M.J.F. Ferreira, C.M. Rangel, A.M.F.R. Pinto

**Process Integration in an Industrial Hazardous Waste Treatment, Elimination and Valorisation System**

P-EN15

P. Pereira, C. Fernandes, H.A. Matos, C. Martins

**Biological treatment of rice straw hemicellulosic hydrolysate aiming to improve ethanol production by *Pichia stipitis***

P-EN16

B.G. Fonseca, A.J. Moya, J.G. Puentes, S. Sánchez, I.C. Roberto

**Cuprous Oxide as a promising Solar Water Splitting Photocathode – Solving the Stability Technological Problems**

P-EN17

J. Azevedo, M. Schreier, M. Stefik, L. Steier, P. Dias, M. Mayer, C.T. Sousa, J.P. Araújo, A.M. Mendes, M. Graetzel, S.D. Tilley

**Nitrogen Limitation on Lipid Accumulation by the Oleaginous Yeast *Rhodospiridium toruloides***

P-EN18

S. Raposo, L. Tangerino, M. Val, F. Guerreiro, M.E. Lima-Costa

**Potential renewable biofuel production by *Chlamydomonas reinhardtii*.**

P-EN19

R.L. Costa, T.V. Oliveira, L.D. Santos, J.S. Ferreira, F.R.X. Batista

**Hydrogen production by photocatalytic reforming of biomass using carbon nanotube-TiO<sub>2</sub> catalysts**

P-EN20

L. Ferreira, J.L. Faria, C.G. Silva

**Influence of the Presence of an Inert Gas in Reactions with Ethanol for H<sub>2</sub> Production with Cu-Ni Catalysts Supported in CeO<sub>2</sub> e Nb<sub>2</sub>O<sub>5</sub>**

P-EN21

I. Dancini-Pontes, M. De Souza, F.A. Silva, M.H.N.O. Scaliante, N.R.C. Fernandes-Machado

**Ethanol Steam Reforming Over Cu-Ni/Nb<sub>2</sub>O<sub>5</sub> Based Catalyst: Evaluation of Mass, Temperature and Reactants Concentration**

P-EN22

F.A. Silva, I. Dancini-Pontes, M.V.C. Gandolfi, M.H.N.O. Scaliante, M. De Souza, N.R.C. Fernandes-Machado

**Catalytic Degradation of Polypropylene using Vermiculites, Montmorillonites and Zeolites**

P-EN23

A. Ćwik, A. Pereira, D. Paulo, M. Motak, T. Grzybek, M.A.N.D.A. Lemos, F. Lemos

**Co-Processing of Waste Plastic Film and Hydrocarbons over HZSM-5**

P-EN24

D. Afonso, I.M. Fonseca, S. Martins-Dias, M.A.N.D.A. Lemos, F. Lemos

**Biodiesel Quality Index based on EN 14214, ASTM D6751 and ANP 14/2012 standards**

P-EN25

C. Ciubota-Rosie, R. dos Santos De Agostini, J.R. Ruiz, M.J. Ramos, Á. Pérez

**Fast Pyrolysis of Banana Leaves in a Fluidized Bed Reactor for Bio-oil and Biochar Production**

P-EN26

N. Sellin, D.R. Krohl, C. Marangoni, O. Souza

**Synthesis and Testing of Polymer Crosslinked Materials for Applications in Energy Storage and Li-S Batteries**

P-EN27

P. Tristão, H. Costa, P. Kadirvel, R.C.S. Dias, M.R.P.F.N. Costa

**The Role of Thermochemical Processes on Biomass Wastes Conversion into Bio-Fuels**

P-EN28

F. Pinto, R.N. André

**Energetic Valorisation of *Eucalyptus Globulus* Stumps by Steam and Oxy-gasification**

P-EN29

R. Andre, F. Pinto, M. Miranda, D. Neves

**Production of Hydrogen for Fuel Cell: Modelling of an Ethanol Microreformer Coupled to a PEMFC**

P-EN30

M. De Souza, S.H.B. Faria, G.M. Zanin, F.F. Moares

**A New Sugar-Rich Substrate, From Agro-Industrial Wastes For Bioethanol Production**

P-EN31

T. Fernandes, D. Monteiro, A. Constantino, B. Rodrigues, C. Felizardo, F. Neves, J. Peinado, M.E. Lima-Costa, S. Raposo

**Pyrolysis of Sweet Sorghum Bagasse: Micro and Pilot scale Analyses**

P-EN32

T.J.P. Oliveira, C.R. Cardoso, C.H. Ataíde

**Effect of the Addition of Metal Chlorides on the Thermal Decomposition of Soybean Hulls**

P-EN33

J.A.S. Júnior, T.J.P. Oliveira, C.H. Ataíde

**Fractionation of Goat Cheese Whey by Membrane Processes in Order to Produce Fermentation Substrate and N-Source**

P-EN34

V. João, M.E. Lima-Costa, R.J. Barros

**Optimization of a Microbial fuel cell (MFC) with *Lactobacillus pentosus***

P-EN35

V.B. Oliveira, L.R.C. Marcon, D.P. Pinto, M. Simões, A.M.F.R. Pinto

**Effect of anode structural properties on the performance of a passive Direct Methanol Fuel Cell (DMFC)**

P-EN36

V.B. Oliveira, J.P. Pereira, A.M.F.R. Pinto

**Carbon Dioxide Recycling to Fuel Products through Photo-reduction with Advanced Catalysts**

P-EN37

S. Tostón, R. Camarillo, F. Martínez, C. Jiménez, I. Asencio, J. Rincón

**POSTER SESSION – MULTI-SCALE MODELLING AND SIMULATION**

**Molecular Dynamics Investigation Of The Interaction Of A Cecropin Melettin Peptide With Gold Surfaces**

P-MS1

A.F. Ferreira, A. Rai, L. Ferreira, P.N. Simões

**Development and introduction of the CALS-technologies in the chemical industry**

P-MS2

A. Bessarabov, T. Stepanova, A. Kvasyuk, A. Vendilo

**Reactor Network Synthesis for the Industrial Adiabatic Benzene Nitration Process**

P-MS3

A. Nogueira, D. Silva, C.G. Baptista

**Simulation of Gas Holdup in Bubble Columns**

P-MS4

F. Yamashita, S. Ichimura



## **H2TT – A Targeting Tool to Analyse an Refinery Hydrogen Network**

P-MS5

J.P. Marques, H.A. Matos, C.P. Nunes

## **Monte Carlo methodology applied to the analysis of the radiation field and scaling up of photo-bio-reactors**

P-MS6

J.M. Heinrich, H.A. Irazoqui<sup>1</sup>

## **Determination of bimodal curves for ternary systems containing biodiesel, alcohol and water**

P-MS7

J. Gomes, T. Santos, J. Puna

## **Azeotropic Distillation Systems: Design and Optimization through simulation with Aspen HYSYS combined with Design of Experiments**

P-MS8

M.V. Mendonça, I.M. João, J.M. Silva

## **Experimental study and modelling of the Fenton process for the treatment of Kraft pulp mill bleaching effluents**

P-MS9

T.R.A. Portela, R.M.B.O. Duarte, A.C. Duarte, I. Portugal

## **POSTER SESSION - SUSTAINABILITY AND ENVIRONMENT**

### **Roadmap for Environmental Impact Retrofit (REIR) – a new framework for selection of sustainable process design alternatives**

P-SE1

A. Carvalho, A.F. Mimoso, A.N. Mendes, H.A. Matos

### **Role of Graphene Surface Chemistry on the Photocatalytic Activity of Graphene-TiO<sub>2</sub> Composites**

P-SE2

A.M.T. Silva, L.M. Pastrana-Martínez, S. Morales-Torres, V. Likodimos, P. Falaras, J.L. Figueiredo, J.L. Faria

### **Red Wine Wastewater Treatment by Electro-Fenton and Photo-Electro-Fenton Processes**

P-SE3

A.M. Díez, E. Rosales, M.A. Sanromán, M. Pazos

### **Optimization of Hydrogen Peroxide Generation in the Electro-Fenton Process: Application on Winery Wastewater Treatment**

P-SE4

O. Iglesias, S. Mediavilla, A.M. Díez, M.A. Sanroman, M. Pazos

### **Catalytic ozonation of sulfamethoxazole in simulated natural water**

P-SE5

A. Gonçalves, J.J.M. Órfão, M.F.R. Pereira

### **Glycerine Valorisation by Acetylation Over Phosphated Silica Catalysts**

P-SE6

A.P. Soares Dias, G. Barreiros, J. Gomes, A. Velez

**Carbon Dioxide Uptake and Nutrient Removal Using Microalgae and Cyanobacteria: The Effect of Light Supply**

P-SE7

A.L. Gonçalves, J.C.M. Pires, M. Simões

**Electrocoagulation For The Treatment Of Phenolic Wastewaters Using a Zn anode**

P-SE8

A.S. Fajardo, R.F. Rodrigues, R.C. Martins, L.M. Castro, R.M. Quinta-Ferreira

**Impact of Land Use on Nutrient Nonpoint Source Pollution: A Case Study in Lis River Basin**

P-SE9

A. Fonseca, C. Botelho, R.A.R. Boaventura, V.J.P. Vilar

**Global Warming Effects on Watershed Impairment by Fecal Coliform Bacteria: A Case Study in Lis River Basin**

P-SE10

A. Fonseca, C. Botelho, R.A.R. Boaventura, V.J.P. Vilar

**Protein fractionation of moringa seed and its application in the treatment of surface water.**

P-SE11

A.T.A. Baptista, M.O. Silva, F.P. Camacho, T.R.T. Santos, L. Ferreira-Pinto, L.B. Beltran, P.F. Coldebella, M.F. Vieira, R. Bergamasco, A.M.S. Vieira

**Characterization of *Moringa Oleifera* seeds from different regions of Brazil.**

P-SE12

M.O. Silva, F.P. Camacho, A.T.A. Baptista, W.M. Giufrida, L. Ferreira-Pinto, E. Bonafe, P.F. Coldebella, J.V. Visentainer, M.F. Vieira, R. Bergamasco, A.M.S. Vieira

**Influence and Interactions of Saponified Matter in the Sorption of Emulsified Vegetable Oil from Water by Cork Granules**

P-SE13

A.M.A. Pintor, R.S. Souza, V.J.P. Vilar, C.M.S. Botelho, R.A.R. Boaventura

**Solar Photocatalytic Reduction of Cr(VI) over TiO<sub>2</sub> or Fe(III) in the Presence of Citric or Oxalic Acid using a Lab CPC Photoreactor**

P-SE14

B.A. Marinho, J.C.B. Lopes, R.A.R. Boaventura, V.J.P. Vilar

**Photocatalytic ozonation of aniline with TiO<sub>2</sub> based materials**

P-SE15

C.A. Orge, M.F.R. Pereira, J.L. Faria

**Enhancement of the Electrokinetic-Fenton Hybrid Technology for Organically-Polluted Soil Remediation**

P-SE16

E. Bocos, C. Fernández-Costas, M. Pazos, M.A. Sanromán

**Cotton Dyeing Wastewater Treatment by Chemical and Biological Processes**

P-SE17

C.S.D. Rodrigues, R.A.R. Boaventura, L.M. Madeira

**Evaluation of the fluoride ions adsorption process in activated bone char**

P-SE18

C. Silveira, P. Marin, Q. L. Shimabuku, P.F. Coldebella, M.F. Silva, F.S. Arakawa, T.R.T. Santos, F.P. Camacho, S.L. Bazana, A.M.S. Vieira, M.F. Vieira, M.C.B.A. Ugri, O.A.A. Santos, R. Bergamasco

**Mono and bimetallic catalysts supported on ZSM5 for the reduction of bromates in water**

P-SE19

C. Freitas, O.S.G.P. Soares, J.J.M. Órfão, M.R.F. Pereira, A.M. Fonseca, I.C. Neves

**Antimicrobial Activity of Essential Oils: Protection of Stored Food**

P-SE20

D.C. Moura, O.C. Nunes, M.M.S.M. Bastos

**Use of sugarcane as constructed wetland vegetation**

P-SE21

D.M.R. Mateus, M.M.N. Vaz, I. Capela, H.J.O. Pinho

**Mn Alginate Beads as Catalyst in Electro-Fenton: Application to the Elimination of Recalcitrant Organic Pollutants**

P-SE22

M.A. Fernández de Dios, E. Alfaya, E. Rosales, M. Pazos, M.A. Sanromán

**Extraction of Value-added Compounds from Spent Coffee Grounds using Supercritical Fluid**

P-SE23

E.M.S. Machado, M. G. Bernardo-Gil, J.A. Teixeira, S.I. Mussatto

**Extraction of Antioxidant Phenolic Compounds by Autohydrolysis of Spent Coffee Grounds**

P-SE24

L.F. Ballesteros, M.J. Ramirez, E.M.S. Machado, C. E. Orrego, J. A. Teixeira and S. I. Mussatto

**Removal of Microcystis sp. cells and microcystis using saline solution of Moringa oleifera by flotation and nanofiltration**

P-SE25

F.P. Camacho, P.F. Coldebella, M.C. Bongiovani, M.O. Silva, A.T.A. Baptista, L.O.R. Moreti, T.R.T. Santos, M.F. Vieira, A.M.S. Vieira, L.A. Coral, F.R. Lapolli, M.T.S.P. Amorim, R. Bergamasco

**Assessing Fish Freshness Using Zeolite Modified Electrodes – Detection of Uric Acid**

P-SE26

M. Ventura, S.C. Matias, L. Fonseca, C.M. Cordas, M.A.N.D.A. Lemos, F. Lemos

**Selective Recovery of Metals From Spent Hydrodesulphurisation Catalysts – A Nearly Closed Environmental-friendly Process**

P-SE27

I.S.S. Pinto, H.M.V.M. Soares

**Novel Photocatalytic Paint towards NO Deep Oxidation**

P-SE28

J. Ângelo, P. Magalhães, L.M. Madeira, L. Andrade, A. Mendes

**VOC generation at different stages of the composting process of municipal solid waste**

P-SE29

J.F. Saldarriaga, S. Upegüi, C.R. Montero, G.E. Morales

**Extraction of Bacterial Poly(3-hydroxybutyrate) using Propylene Carbonate Combined with: Thermal Treatment, Ultrasound and High-Pressure Homogenizer**

P-SE30

L.K. Quines, M. Schmidt, K. Zanfonato, F.M. Martinhago, W. Schmidell, G.M.F. Aragão

**Grapefruit Peelings a Promising Biosorbent for Remediation of Wastewaters from Tannery Industry**

P-SE31

R. Torras, J. Meijide, L. Ferreira, E. Rosales, T. Tavares, M.A. Sanromán, M. Pazos

**Synthesis of a Molecularly Imprinted Polymer Selective to Galaxolide**

P-SE32

L. Figueiredo, L. Santos, A. Alves

**Use of Porous Media Impregnated with Metal for Virus Removal**

P-SE33

Q.L. Shimabuku, F.S. Arakawa, P.F. Coldebella, F.P. Camacho, M.F. Silva, T.R. T. Santos, L.O.R. Moreti, L. Nishi, S. Bazana, C. Silveira, T.U. Nakamura, M.F. Vieira, A.M.S. Vieira, O.A.A. Santos, R. Bergamasco

**Integration of Nanofiltration and Ozonation for the Removal of Sulfamethoxazole and Diclofenac from Water Streams**

P-SE34

M. Cardoso, R.C. Martins, L.M. Gando- Ferreira, R.M. Quinta-Ferreira

**Study of the cyanobacteria removal using *Moringa Oleifera* seeds with subsequent characterization of generated sludge**

P-SE35

L.O.R. Moreti, P.F. Coldebella, F.P. Camacho, A.K. Gohara, A.H.P. Souza, T.R.T. Santos, M.F. Silva, K.C. Valverde, M. Matsushita, M.F. Vieira, L. Nishi, Q.L. Shimabuku, F.S. Arakawa, R. Bergamasco

**Termiticidal and Repellence Activity from Extract and Lectin of *Opuntia ficus indica* on *Nasutitermes corniger***

P-SE36

L.C.B.B. Coelho, I.F.A.C. Souza, G.M.S. Santana, L.P. Albuquerque, A.C. Agra-Neto, A.C. Albuquerque, L.A. Luz, T.H. Napoleão, P.M.G. Paiva

**Brown Marine Macroalgae *Ascophyllum nodosum* as a Natural Cation Exchanger for Copper Ions**

P-SE37

L.P. Mazur, T.A. Pozdniakova, R.A.R. Boaventura, V.J.P. Vilar

**Valorisation of Lignocellulosic Biomass over Metal Supported Carbon Materials: One-pot Cellulose Conversion into Sugar Alcohols**

P-SE38

L.S. Ribeiro, J.J. Delgado, J.J.M. Órfão, M.F.R. Pereira

**New 1,10-Phenanthroline-5,6-dione Rhenium Complexes as Catalysts for the Baeyer-Villiger Oxidation of Ketones under Mild Conditions**

P-SE39

L. Martins, E. Alegria, C. Domingos, I. Sousa, P. Smolénski, A. Pombeiro

**Evaluation of different extract methods to produce grape seed oil**

P-SE40

M.L. Menezes, F. Lini, J.F. Medeiros, V.Y. Kajiharar, M.S.C. Sakamoto, M. F. Vieira, N.C. Pereira

**Biological Treatment of Soil Contaminated by Crude Biodiesel Using Rotating Bioreactor**

P-SE41

M.L.F. Raminho, E.J. Ribeiro, V.L. Cardoso, U.C. Filho, M.L. Cruz

**Evaluation of eco-friendly coagulant from *Moringa oleifera* Lam combined with the anionic polymer Pa0823 for natural organic matter removal**

P-SE42

T.R.T. Santos, M.F. Silva, M.C. Bongiovani, L.Nishi, P.F.Coldebella, L.B. Beltran, A.M.S. Vieira, M.F. Vieira, R. Bergamasco

**Incorporation of sludge from water treatment in manufacture of particleboards**

P-SE43

C.A. Silva, A.A. Silva, G.N. Silva, L. Nishi, F.J. Bassetti, A.M.S. Vieira, M.F. Vieira, M.F. Silva, L.C.S.H. Rezende, R. Bergamasco

**Synthesis and characterization of nano zero-valent iron particles for environmental remediation**

P-SE44

M.J. Quina, D.V. Lopes, E.M. Neto, R.C. Martins, L. Gando-Ferreira, C. Dias-Ferreira, R. Quinta-Ferreira

**Anaerobic Digestion – Evaluate the sludge biodegradability from Guia WWTP**

P-SE45

M.T. Santos, A.M. Barreiros

**Evaluation of Sludge Production in Portugal**

P-SE46

M.T. Santos, A.O. Ferreira, A.M. Barreiros

**Study of the Influence of Temperature on Resistance to Ethanol by an Industrial Strain of *Saccharomyces cerevis***

P-SE47

M.L. Cruz, M.L.F. Raminho, M.M. de Resende, E.J. Ribeiro

**Groundwater Protection of Metals and Persistent Organic Compounds by Permeable Adsorbing Barriers using Chestnut Shells**

P-SE48

M. Cobas, E. Rosales, M.A. Sanroman, M. Pazos

**Removal of Di-(2-ethylhexyl)phthalate (DEHP) from Water Using a LECA-*Pseudomonas putida* Biobarrier**

P-SE49

E. Rosales, M. Cobas, T. Tavares, M.A. Sanromán, M. Pazos

**Purification by centrifugation with addition of water to biodiesel ethyl from crude canola oil**

P-SE50

J.F. Medeiros, M.F. Vieira, M.C.B. Ugri, M.L. Menezes, M.C.S. Gomes, N.C. Pereira, O.C. da M. Lima

**Sustainability Indicators Selection for Chemical Processes: Contributions for a Methodology**

P-SE51

A.A. Martins, N.S. Caetano, C. Silva, T.M. Mata

**Microalgal Culture as a Negative Emission Technology: Potential Evaluation**

P-SE52

N.F.P. Silva, F.G. Martins, M.C.M. Alvim-Ferraz, V.J.P. Vilar, J.C.M. Pires

**Hybrid gravitational membrane process using activated carbon for drinking water purification**

P-SE53

N.U. Yamaguchi, O.A.A. Santos, P.F. Coldebella, M.F. Silva, S.A.L. Abe, A.M.S. Vieira, M.C.B.A. Ugri, R. Bergamasco

**Effective extraction of carbohydrates from hydrophilic ionic liquids through selective precipitation**

P-SE54

A.P. Carneiro, O. Rodríguez, E.A. Macedo

**Galaxolide detection in children personal care products in Oporto metropolitan area**

P-SE55

P. Correia, A. Cruz, L. Santos, A. Alves

**Application of Moringa oleifera seeds as a natural adsorbent for Atrazine removal of contaminated waters**

P-SE56

P.F. Coldebella, L. Nishi, M.F. Silva, F.P. Camacho, M.F. Vieira, A.M.C. Vieira, M.R. Fagundes-Klen, M.T.S.P. Amorim, O.A.A. Santos, R. Bergamasco

**Silver and Copper Oxide Nanoparticles Impregnated on Activated Carbon for Antibacterial Applications**

P-SE57

F.S. Arakawa, Q.L. Shimabuku, P.F. Coldebella, M.F. Silva, F.P. Camacho, T.R.T. dos Santos, L.O.R. Moreti, S.L. Bazana, C. Silveira, D. Rezende, G. Justen, B.A. Abreu Filho, A.M.S.Vieira, M.F.Vieira, O.A.A. dos Santos, R. Bergamasco

**Indoor Air Quality in a Rural Preschool – Particulate Matter Assessment**

P-SE58

R.A.O. Nunes, P.T.B.S. Branco, M.C.M. Alvim-Ferraz, F.G. Martins, S.I.V. Sousa

**Indoor Air Quality in a Rural Preschool – Gaseous Compounds and Radon Assessment**

P-SE59

R.A.O. Nunes, P.T.B.S. Branco, M.C.M. Alvim-Ferraz, F.G. Martins, S.I.V. Sousa

**New design for oxidation ditches with a novel aerator device: the Pressurized Aeration Chamber**

P-SE60

A.M. Karpinska, M.M. Dias, R.A.R. Boaventura, J.C.B. Lopes, R.J. Santos

**Oxidation of Mixtures of Ethyl Acetate and Butyl Acetate Over Cryptomelane and the Effect of Water Vapour**

P-SE61

O.S.G.P. Soares, J.J.M. Órfão, M.F.R. Pereira

**Microwave-Assisted Extraction of Alginate from Brown Algae**

P-SE62

F. Gomes, F. Oliveira, M. Correia, S. Morais, C. Delerue-Matos

**Levels of PM1-bound Polycyclic Aromatic Hydrocarbons in the Indoor Air of an Urban Pre-school**

P-SE63

M. Oliveira, K. Slezakova, C. Delerue-Matos, M. C. Pereira, S. Morais

**Brown Macroalgae as Natural Cation Exchangers for the Treatment of a Zinc Containing Galvanization Wastewater**

P-SE64

T.A. Pozdniakova, L.P. Mazur, R.A.R. Boaventura, V.J.P. Vilar

**Simulation of Energy-saving Aeration Control in a Decentralized Wastewater Treatment Plant under a COD Sensor Fault**

P-SE65

T. Arriaga, R. Ribeiro, H. Pinheiro, C. Pinheiro, M.C. Almeida

**Remediation of soils contaminated with pesticides by using an innovative technique - Supercritical extraction (SCE) with carbon dioxide coupled with ultrasounds**

P-SE66

T. Castelo-Grande, P.A Augusto, D. Barbosa

**Ultrasound-Assisted Dispersive Liquid-Liquid Microextraction for the Determination of Synthetic Musk Fragrances in Water Matrices**

P-SE67

V. Homem, A.A. Alves, A. Alves, L. Santos

**Prioritization Approach to Score and Rank Synthetic Musk Compounds for Environmental Risk Assessment**

P-SE68

V. Homem, N. Ratola, J.A. Silva, L. Santos, A. Alves

**Process Intensification of a Solar Photo-Fenton Reaction Through the Use of Ferrioxalate Complexes for the Treatment of a Cotton-Textile Dyeing Wastewater**

P-SE69

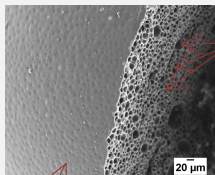
L. Doumic, P. Soares, M.A. Ayude, M. Cassanello, R.A.R. Boaventura, V.J.P. Vilar

**Selective Separation and Recovery of Iron, Zinc and HCl from Galvanizing Industrial Effluents**

P-SE70

J.M.A. Rodrigues, M.L.F. Gameiro, R.M. Machado, M.R.C. Ismael, M.T.A. Reis, J.M.R. Carvalho

Á. Dias<sup>1</sup>, J. Ferra<sup>2</sup>, J. Martins<sup>3</sup>, L. Carvalho<sup>3</sup>, F.D. Magalhães<sup>1,\*</sup> (1) LEPABE - Faculdade de Engenharia da Universidade do Porto, Rua Dr. Roberto Frias 4200-465, Porto, Portugal, (2) EuroResinas - Industrias Químicas, S.A., 7520-195, Sines, Portugal, (3) DEMad - Instituto Politécnico de Viseu, Campus Politécnico de Repeses 3504-510, Viseu, Portugal; \*fdmagalh@fe.up.pt.



crosslinked polyester



Particles sizes: 1-4 mm

This work studies the synthesis of low density particles (LDPs) based on crosslinked polyester, each particle containing numerous air-filled vesicles. Due to its particular internal structure and rigidity they can be used as fillers in wood-based panels to reduce the final density and keep their desired mechanical performance. Important process variables as stirring conditions, type of cure initiator and drying conditions were studied. Particles well vesiculated and with diameters in the range 1-4 mm were prepared and its performance in wood-based panels is an on-going study.

## Introduction

In the last decades, the furniture industry's demand for light wood-based panels has increased, in particular due to the popularity of "takeaway" furniture. Consumers prefer products that are available at time of purchase and that can be easily handled which justifies lightness as the fundamental requirement. On the other hand, there is a current trend in furniture design that involves high thickness components, and hence a reduction of weight is desirable, for economical (material and transportation costs), environmental reasons (resources, eco-efficiency), and organizational reasons.

Numerous approaches have been made to save weight by using low density wood species [1] or other plant fibers (e.g. hemp [2]), sandwich panels with foam core [3] or honeycomb core [4], or by incorporating polymeric particles during wood-based panels production (e.g. expanded polystyrene [5]). However, the reduced weight comes along with a decline of the mechanical properties (bending strength and internal bond), the porous edges decrease the resistance to axial withdrawal of screws and prejudices the quality of finishing (coating, edge lamination) and machinability. In this study, low density particles (LDPs) made of crosslinked polyester were introduced as light fillers for wood-based panels. These particles combine low density and high mechanical resistance as a result of an internal multi-alveolar structure separated by rigid polymeric walls. Some studies about the production of multivesiculated polyester particles with a mean size of 10 µm are already available in

the literature [6] still with the purpose of its application as opacifiers in paints. In the wood-panels case, larger particles (diameters above 1mm) are desired. In this study, the influence of the stirring rate conditions, type of cure initiator and the drying process conditions on final internal vesiculation, particle size and density were studied. The performance of the optimized particles will then be evaluated in wood-based particleboards.

## Particles preparation and characterization

For producing LDPs, an organic phase comprising unsaturated polyester dissolved in styrene, is dispersed in an aqueous solution of polyvinyl alcohol (PVA) at high stirring rate. A base is previously added to the organic phase, causing the neutralization of the polyester carboxyl groups and forming polyester salts which leads to the diffusion from the external aqueous medium. This entrapped water forms the internal vesicles, and the whole system becomes a water-in-oil-in-water (W/O/W) emulsion (double emulsion). A radical polymerization is then initiated by adding a water soluble initiator system (cumene hydroperoxide in combination with a metal redox activator).

Final LDPs are then washed with distilled water and dried at 80 °C for 2 hours.

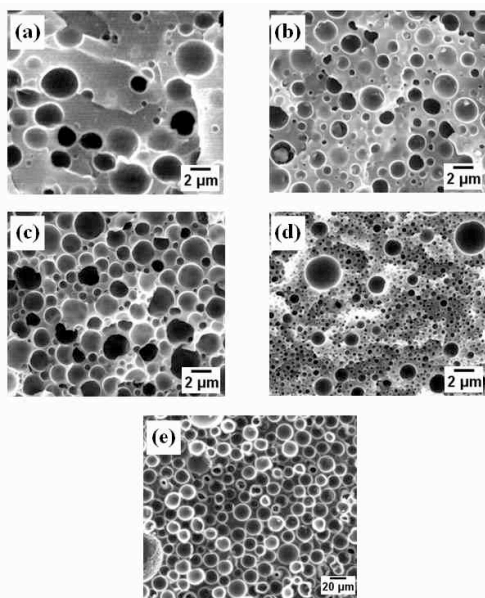
Final particle size distributions were obtained by sieving (sieves with open mesh of 100 µm, 1 mm and 2 mm, supplied by Retsch). Particle morphology and internal vesiculation were observed by scanning electron microscopy (SEM), using a JEOL JSM-6301F, Oxford INCA Energy



350 equipment. For this purpose, dried particles were encapsulated in epoxy resin, and the resulting composite was fractured after hardening at 90 °C overnight. Before being analyzed, samples were sputtered with gold/platinum using a K575X Sputter Coater by Quorum Technologies. The bulk density of the particles was determined by mercury porosimetry.

## Results

During the dispersion phase, the studied stirring rates were: 200 RPM, 600 RPM, 750 RPM, 1000 RPM and 1400 RPM, maintaining the rest of process variables. Figure 1 depicts the internal morphology of the particles and two different trends seem to exist.

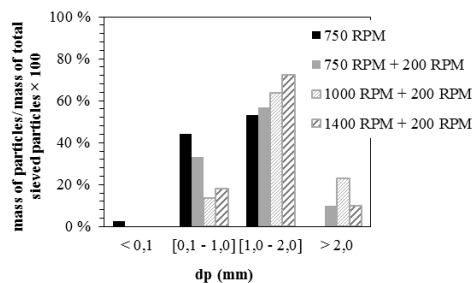


**Figure 1.** Middle of a fractured polyester particle produced with different dispersion stirring rates: 200 RPM (a), 600 RPM (b), 750 RPM (c), 1000 RPM (d) and 1400 RPM (e).

For the lowest shear rates, the number of vesicles in the middle of the particle increased, maintaining an average size of 2 μm (Figure 1a, 1b and 1c) which means that the higher stirring was favouring the diffusion of external water into the organic droplets. SEM images from a peripheral zone of Figures 1a and 1b evidenced a larger number of vesicles and corroborated that lower stirring rates were not enough to promote water diffusion towards the centre of the droplet. Higher stirring rate caused successive droplet rupture/coalescence, leading to large heterogeneity in final vesicles sizes (Figure 1d). Finally, at 1400 RPM, vesicles were almost uniformly formed with

much larger sizes (15 μm), as showed in Figure 1e. The improvement in vesiculation justified the decreasing in measured densities values from 1000 kg/m<sup>3</sup> to 600 kg/m<sup>3</sup>.

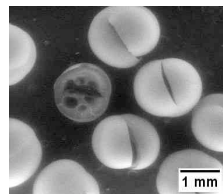
Due to the influence of dispersion parameters on the final particle sizes, a second step, at lower stirring rate, was implemented in order to allow droplet coalescence and formation of larger particles. Figure 2 shows the particle size distribution of LDPs studied at these conditions.



**Figure 2.** Influence of the implementation of a second lower stirring rate during the dispersion phase on the final particle size distribution.

As predicted, the implementation of a lower second stirring period favoured the coalescence of the organic droplets into bigger one, leading to a displacement of the final distribution to the right and removing particles smaller than 100 μm. Not so predictable was the observed tendency for obtaining larger particles by increasing the first stirring rate. In this regime, higher stirring is increasing droplet coalescence due to more frequent collisions.

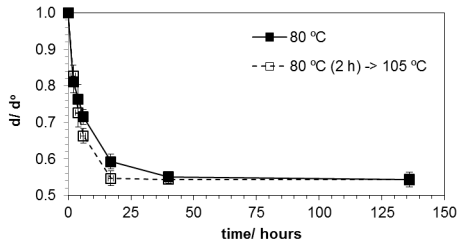
Cured particles fractured during the final drying stage at 80 °C (Figure 3), probably due to internal pressure created by water vapour combined with residual stresses originated during cure. Replacing the water-soluble radical initiator by an organic-soluble one, solved the problem, due to a more uniform curing throughout the entire particle.



**Figure 3.** Fractured particles after the drying process at 80 °C for 2 hours.

Due to the importance in obtaining particles with the lowest density, the final drying process is a critical stage. Particles with the same diameter (4

mm) were first dried at 80 °C for 2 hours to avoid the internal fracture. One of the series was then kept at this temperature while the other particles were left to dry at 105 °C till the final mass keep constant. The volume of the particles was indirectly measured by a caliper rule. Figure 4 shows the evolution of the calculated density in relation to the initial value ( $d/d^0$ ) during the drying process. The density of the polymer (polyester reticulated with styrene) was determined by water pycnometry and it corresponded to 1211 kg/m<sup>3</sup>.



**Figure 4.** Evolution of the normalized density of particles during the drying process.

As predicted, the drying process can be accelerated by increasing the drying temperature and it was verified that it not compromised the internal structure. According to the results, it might be possible to take off the internal water

from the vesicles after 48 hours. The final density of the dried particles corresponded to 600 kg/m<sup>3</sup>.

### Conclusions

Low density particles (LDPs) made of crosslinked polyester that incorporate numerous air-filled domains and with sizes in the range 1 - 4 mm were synthesized. For its preparation, some process variables are now well understood: higher stirring rates during the dispersion of polyester droplets leads to less dense particles due to better vesiculation. Larger particles can be obtained by implementing a second step at a lower stirring rate. Tendency to fracture during drying was eliminated by using an organic-soluble cure initiator. LDPs must be dried at least 2 days at 80 °C, to remove as much water as possible and achieve the lowest density.

We are now evaluating the performance of these particles in wood-based panels, namely the intended compromise between panel density, internal bond and bending strength.

### Acknowledgements

This work is co-funded by FEDER/QREN (Lightfillers project with reference FCOMP-01-0202-FEDER-30178 in the framework of Programa Operacional Factor de Competitividade.

### References

- [1] G. Coudenys, S. Lauwers, Board material on the basis of wood, Unilin BVBA, European Patent: 2374588A1, 2011.
- [2] N. Stevulova, J. Cigasova, A. Sicakova et al., Lightweight composites based on rapidly renewable natural resource, *Chemical Engineering Transactions*, 35 (2013) 589.
- [3] M. Link, C. Kolbitsch, G. Tondi et al., Formaldehyde-free tannin-based foams and their use as lightweight panels, *Bioresources*, 6 (2011) 4218.
- [4] D. Carbery, R. Ikegami, T. Martin et al., Lightweight honeycomb panel structure, The Boeing Company, US Patent: 5445861A, 1995.
- [5] A. Shalbafan, J. Luedtke, J. Welling et al., Physicomechanical properties of ultra-lightweight foam core particleboard: different core densities, *Holzforschung: International Journal of the Biology, Chemistry, Physics, and Technology of Wood*, 67 (2013) 115.
- [6] Â. Dias, J. Fidalgo, J. Machado et al., Study of multivesiculated polyester particles synthesis by double emulsion process, *European Polymer Journal*, 49 (2013) 6.