



BIOPOL-2013. SCIENTIFIC PROGRAMME

ROME. 1ST-3RD OCTOBER 2013



Tuesday 1st October 2013

08.00-08.40h Registration / Installation of posters (Session A)

Session 1. Chairperson José M. Kenny

08.40-08.50. Welcome and opening. José M. Kenny & Alfonso Jiménez

08.50-09.30. Opening Lecture. Lars Berglund (Dept of Fiber and Polymer Technology Wallenberg Wood Sci Center Royal Institute of Technology (KTH), Stockholm, Sweden). "High performance biocomposites based on cellulose nanofibers - strength, ductility and moisture stability"

09.30-09.50. Oral Communication 1. Jean Pierre Pascault (IMP@INSA, UMR-CNRS 5223 INSA, France). "Bio-Based Vinyl Levulinate as Styrene Replacement for Unsaturated Polyester Resins"

09.50-10.10. Oral Communication 2. Sandrine Therias (Institut de Chimie de Clermont-Ferrand Equipe Photochimie Université Blaise Pascal, France). "Photooxidation and photocatalytic oxidation of polylactide (PLA)"

10.10-10.30. Oral Communication 3. Sicco de Vos (Corbion, Purac Biochem B.V.). "Temperature dependence of crystalline transitions in highly-oriented PLLA/PDLA blend: In-situ synchrotron X-Ray scattering study"

10.30-11.30. Coffee Break and poster session A



Session 2. Chairperson Luc Averous

11.30-12.00 Keynote Lecture 1. José M^a Lagarón (Instituto de Agroquímica y Tecnología de Alimentos. CSIC. Spain). “Fully Renewable High Barrier Biopolyester-Based Structures”

12.00-12.20. Oral Communication 4. Dimitrios Bikiaris (Aristotle University of Thessaloniki, Greece). “Effect of nanofillers type on the enzymatic degradation of aliphatic polyesters. The case of poly(ϵ -caprolactone)”

12.20-12.40. Oral Communication 5. Florent Allais (Chaire Agro-Biotechnologies Industrielles (ABI) – AgroParisTech, France). “Synthesis and polycondensation of bio-based macrodiols containing ferulic acid”

12.40-13.00. Oral Communication 6. Stamatina Vouyiouka (Department of Process and Product Development School of Chemical Engineering, National Technical University of Athens, Greece). “Assessment of solid state polymerization effectiveness for poly(butylene succinate) production”

13.00-14.30. Lunch / Installation of posters (Session B)

Session 3. Chairperson José M. Lagarón

14.30-15.10. Invited Lecture. Julio San Román (Instituto de Ciencia y Tecnología de Polímeros, CSIC, Spain). “Biocompatible and resorbable porous systems by mild-technology based on cryogenic reactions”

15.10-15.30. Oral Communication 7. Vincent Verney (Institut de Chimie de Clermont-Ferrand - ICCF Université Blaise Pascal). “Influence of UV aging onto the photodegradation biodegradability relationship of biodegradable polymers”

15.30-15.50. Oral Communication 8. Marina Ramos (University of Alicante, Spain). “Influence of thymol and silver nanoparticles on the biodegradation of nano-biocomposites based on poly(lactic acid): Thermal and morphological properties”

15.50-16.10. Oral Communication 9. Patrizia Cinelli (Department of Civil and Industrial Engineering, University of Pisa, Italy). “Whey protein based barrier coating which either enable recyclability or maintain compostability of multilayer films”

16.10-17.10. Coffee Break and poster session B



Session 4. Chairperson Lars Berglund

17.10-17.40. Keynote Lecture 2. Ramani Narayan (Michigan State University, USA). "Misuse and Abuse of Biodegradability Claims in the Marketplace and in the Scientific Literature - Understanding the Science and exploring the problems and issues".

17.40-18.00. Oral Communication 10. Claudio Gerbaldi (Institute of Chemistry Department of Applied Science and Technology - DISAT POLITECNICO DI TORINO, Italy). "Flexible cellulose-based electrodes: Towards eco-friendly all-paper Li-ion batteries"

18.00-18.20. Oral Communication 11. Eduardo Fagés (Instituto Tecnológico Textil, AITEX, Alcoy, Spain). "Mechanical characterization of biocomposites made from Wet-Laid technology"

18.20-18.40. Oral Communication 12. Paola Orsolini (Swiss Federal Laboratories for Materials Science and Technology (EMPA), Applied Wood Materials Laboratory, Dübendorf, Switzerland). "Microfibrillated cellulose from waste resources: Possibilities of low-cost production on the semi-industrial scale"

18.20-18.40. Oral Communication 13. Shah Ali Ul Qader (The Karachi Institute of Biotechnology and Genetic Engineering (KIBGE), University of Karachi, Pakistan). "Degradation of pectin using immobilized polygalactouronase in polyacrylamide gel for continuous use"



Wednesday 2nd October 2013

08.00-08.30h Registration/Installation of posters (Session C)

Session 5. Chairperson Julio San Román

08.30-09.10. Invited Lecture. Philippe Dubois (University of Mons, Belgium). "Polylactide-based materials: from stereo-controlled polymerization by reactive extrusion to high performance nanocomposites"

09.10-09.40. Keynote Lecture 3. Luc Averous (University of Strasbourg, France). "Dimerized fatty acids as building blocks - Towards new and biobased macromolecular architectures"

09.40-10.00. Oral Communication 14. Paola Fabbri (Dipartimento di Ingegneria "Enzo Ferrari" - DIF Università di Modena e Reggio Emilia). "Conductive polyhydroxyalkanoates bionanocomposites containing carbon-based fillers"

10.00-10.20. Oral Communication 15. Zbigniew Florjanczyk (Faculty of Chemistry, Warsaw University of Technology). "Telechelic oligomers of lactic acid as macroinitiators in ring opening copolymerization of maleic anhydride with propylene oxide"

10.20-11.20. Coffee Break and poster session C



Session 6. Chairperson Alfonso Jiménez

11.20-11.50 Keynote Lecture 4. Stefano Fiori (Condensia Química S.A, Spain). “Impact strength modifiers for wood fibers /PLA composites”

11.50-12.10. Oral Communication 16. Eric Dargent (LECAP EA4528 International Laboratory, Institut des Matériaux de Rouen, Université et INSA de Rouen). “Molecular mobility in the amorphous phase of plasticized Poly(lactic acid)”

12.10-12.30. Oral Communication 17. Fengwei Xie. (Australian Institute for Bioengineering and Nanotechnology. The University of Queensland). “Ionic liquid-plasticised starch-based materials”

12.30-12.50. Oral Communication 18. Emmanuelle Gastaldi (UMR IATE "Agropolymers Engineering & Emerging Technologies" Montpellier SupAgro, INRA, UM2, Montpellier, France). “Performance and environmental impact of biodegradable polymers as agricultural mulch films”

12.50-13.10. Oral Communication 19. Regina Jeziorska (Industrial Chemistry Research Institute Warsaw, Poland) “Effect of the nanofiller type on the structure and selected properties of polylactide/thermoplastic starch blends”

13.10-14.30. Lunch / Installation of posters (Session D)



Session 7. Chairperson Ramani Narayan

14.30-15.00. Keynote Lecture 5. Carmen Mijangos (Instituto de Ciencia y Tecnología de Polímeros, CSIC, Spain). “Polymer microparticles by conventional methods and microfluidics”.

15.00-15.20. Oral Communication 20. Kalappa Prashanta (Polymers and Composites Technology & Mechanical Engineering Department Ecole des Mines de Douai, France). “Multifunctional biobased polyamide-11/halloysites nanocomposites: Processing and characterization”

15.20-15.40. Oral Communication 21. Kristine Koch (Department of Food Science, Swedish University of Agricultural Sciences, Uppsala, Sweden). “Molecular and material aspects of films made from hydrophobic starches with different botanical background”

15.40-16.00. Oral Communication 22. James H. Wang (Kimberly-Clark Corporation, Corporate Research and Engineering, 2100 County Road II, Neenah, WI 54946, USA). “Hybrid bio-based polyethylene materials”

16.00-17.00. Coffee Break and poster session D

Session 8. Chairperson Philippe Dubois

17.00-17.30. Keynote Lecture 6. Alessandro Gandini (Universidade de São Paulo, Instituto de Química de São Carlos, IQSC, Brazil). “Marriage of plant oils and furans to deliver new polymers through click chemistry”

17.30-17.50. Oral Communication 23. Antonio Martínez Richa (Universidad de Guanajuato, Mexico). “Synthesis of degradable polyester-urethanes and block copolymers using lipase biocatalysis”

17.50-18.10. Oral Communication 24. Clara García-Astrain (Materials + Technologies’ Group. University of the Basque Country). “Aqueous Diels-Alder cycloaddition for the design of furan modified methacrylate based-hydrogels”

18.10-18.30. Oral Communication 25. Pei-Yu Kuo (Faculty of Forestry, University of Toronto, ON, Canada). “Synthesis and properties of bark-derived epoxy resins”

20.30- Conference Dinner: Teatro Centrale Carlsberg - Via Celsa, 6



Thursday 3rd October 2013.

08.00-08.30h Registration/Installation of posters (Session E)

Session 9. Chairperson Stefano Fiori

08.30-09.10. Invited Lecture. Mario Malinconico (Istituto di Chimica e Tecnologia dei Polimeri, Italy). "Compostable and soil degradable plastics: when the innovation is driven by environmental needs".

09.10-09.30. Oral Communication 26. Jan Pielichowski (Department of Chemistry and Technology of Polymers, Cracow University of Technology, Krakow, Poland). "Modification of DNA: Synthesis and characterization of new DNA-lipid structures"

09.30-09.50. Oral Communication 27. Artur J.M. Valente (University of Coimbra, Portugal). "DNA hydrogels for controlled release"

09.50-10.10. Oral Communication 28. Vanja Kokol (University of Maribor Institute of Engineering Materials and Design, Maribor, Slovenia). "Biocatalytical modification of nanocellulose"

10.10-10.30. Oral Communication 29. Mohammad Dalour Hossen Beg. (Faculty of Chemical and Natural Resources Engineering University Malaysia Pahang). "Oil palm empty fruit bunch fiber reinforced Poly lactic acid biocomposites: Effects of fiber length and ultrasound treatment"

10.30-11.30. Coffee Break and poster session E



Session 10. Chairperson Carmen Mijangos

11.30-12.00 Keynote Lecture 7. Suprakas Sinha Ray (National Centre for Nano-Structured Materials. CSIR, South Africa). “Role of Organoclay in Property Optimization of Biodegradable Polylactide/Poly[(butylene succinate)-co-adipate] Blends”

12.00-12.20. Oral Communication 30. Jean-Marie Raquez (University of Mons, Belgium). “Design of fully biodegradable impact resistant polylactide-based materials mediated with nanofillers: From toughness to supertoughness”

12.20-12.40. Oral Communication 31. Qi Zhou (Division of Glycoscience School of Biotechnology Royal Institute of Technology (KTH) AlbaNova University Center Stockholm). “Elastic and high toughness aerogel composites from epoxy/cellulose nanocrystals”

12.40-13.00. Oral Communication 32. Ana Beltrán (ITENE). “Improvement of biopolymer properties for packaging applications by using natural reinforcements”

13.00-13.20. Oral Communication 33. Daniela Rusu (Ecole des Mines de Douai, France). “Characterisation of low-odour emissive polylactide/cellulose fibre biocomposites for automotive applications”

13.20-14.40. Lunch / Installation of posters (Session F)



Session 11. Chairperson Suprakas Sinha Ray

14.40-15.00. Oral Communication 34. Pierfrancesco Morganti (MAVI Sud S.r.l.). "A multifunctional polymer from discarded material: Chitin nanofibril"

15.00-15.20. Oral Communication 35. Gabriella Santagata (Italian National Research Council (CNR), Institute of Chemistry and Technology of Polymers, Italy). "Study on UV-weathering degradation and biodegradation of chitosan composites"

15.20-15.40. Oral Communication 36. Águeda Sonseca (Instituto de Tecnología de Materiales, Universidad Politécnica de Valencia (UPV), Spain). "Reinforcement effect of cellulose nanocrystals in a poly(mannitol-sebacate) bioelastomer"

15.40-16.00. Oral Communication 37. Xiaoqing Zhang (CSIRO Materials Science and Engineering, Australia). "Natural polymer biocomposites from processing"

16.00-16.20. Oral Communication 38. Krystyna Cieśla (Institute of Nuclear Chemistry and Technology Warsaw, Poland). "Modification of the structure and the functional properties of the starch-based films by radiation treatment and addition of lipids/surfactants"

16.20-17.20. Coffee Break and poster session F

Session 12. Chairperson Alessandro Gandini

17.20-17.40. Oral Communication 39. Sashi Pankaj (Dublin Institute of Technology, BioPlasma Research group, School of Food Science and Environmental Health). "Effects of in-package dielectric barrier discharge atmospheric plasma on polylactic acid"

17.40-18.00. Oral Communication 40. Alejandra Torres (Food Packaging Laboratory LABEN-Chile University of Santiago de Chile), "Characterization and kinetic release of thymol from PLA nanocomposites for active packaging"

18.00-18.20. Oral Communication 41. Jayita Bandyopadhyay (DST/CSIR National Centre for Nanostructured Materials, CSIR, Pretoria 0001, South Africa). "Usual cold crystallization behavior of biodegradable poly[(butylene succinate)-co-adipate] nanocomposites"

18.20-18.40. Oral Communication 42. R.M.Yunus (Faculty of Chemical & Natural Resources Engineering, University of Malaysia Pahang Darul Makmur, Malaysia), "Effects of maleic anhydride on sago starch filled Low Density Polyethylene composites"



18.40-18.50. Concluding Remarks and presentation of BIOPOL-2015

POSTER SESSION A (Tuesday 1st October, morning session)

PA.1. M. Boufarguine, A. Ruellan, S. Domenek, V. Ducruet, A. Guinault, G. Miquelard-Garnier and C. Sollogoub. "PHBV as a functional component for improving ductility of polylactide"

PA.2. V. Bourg, P. Lenny, N. Le Moigne, V. Guillard, A. Bergeret. "Shrinkage behavior of biopolyester cast films developed for packaging applications"

PA.3. I. Zembouai, S. Bruzaud, M. Kaci², Y. Grohens. "Poly(3-Hydroxybutyrate-co-3-hydroxyvalerate) and polylactide blends: An efficient way to modulate functional properties of materials"

PA.4. N. Burgos, S. Fiori, V.P. Martino, A. Jiménez. "Evaluation of the barrier and migration properties of nano-biocomposites based on PLA and oligomeric lactic acid with different D/L ratio"

PA.5. L. Dobircau, N. Delpouve, R. Herbinet, C. Courgneau, S. Domenek, L. Le Pluart, E. Dargent. "Effect of two plasticizers on the physical aging of polylactide"

PA.6. M. Deroiné, A. Le Duigou, Y.M. Corre, P.Y. Le Gac, P. Davies, G. César, S. Bruzaud. "Accelerated ageing of polylactide in aqueous environment"

PA.7. S. Vouyiouka, P. Theodoulou, A. Symeonidou, C. D. Pappaspyrides, R. Pfaendner. "Exploring solid state polymerization of poly(lactic acid)"

PA.8. E. Olewnik. "Alterations in thermal properties of polylactide-based composites exposed to UV radiation"

PA.9. E. Olewnik, J. Richert, I. Koter. "Influence of UV irradiation on structure, kinetics and mechanism of polylactide based composites"

PA.10. I. Armentano, E. Fortunati, F. Dominici, F. Luzi, N. Burgos, A. Jimenez, J.M. Kenny, J. Ahn, S. Kang, M. Kim, K. Yoon. "Multifunctional composites based on biopolymers and biobased additives for food packaging applications"

PA.11. E. Fortunati, M. Peltzer, S. Mattioli, S. Rinaldi, N. Bloise, L. Latterini, L. Visai, I. Armentano, A. Jiménez, J.M. Kenny. "Nanocomposite and surface coating approach for improved barrier, antibacterial and migration properties of PLA based films"

PA.12. C. Peña, T. Yurramendi, G. Mondragon, A. Eceiza, A. Arbelaiz. "Wool fibres as reinforcements in poly(lactic acid) composites"

PA.13. R.A. da Silva-Buzanello, M.F. de Souza, K.C. Kaufmann, P.H.H. de Araújo, C. Sayer, F.V. Leimann, O.H. Gonçalves. "Effect of experimental parameters on the particles size of poly(L-lactic acid) nanoparticles"



- PA. 14.** R. Herbinet, L. Le Pluart, P.J Madec. "Reactive plasticization of Poly(lactic acid) by rubbery epoxy system"
- PA.15.** K. Jarukumjorn, S. Tachaphiboonsap. "Effect of poly(lactic acid) grafted with maleic anhydride on mechanical and morphological properties of thermoplastic starch/poly(lactic acid) blends"
- PA.16.** K. Jarukumjorn, J. Nomai. "Toughened improvement of sawdust/poly(lactic acid) composites"
- PA.17.** M. Kodal, H. Şirin, G. Özkoç. "Effects of residence time in compounding on the mechanical, thermal and morphological properties of plasticized PLA composites including hydroxyl and epoxy particles"
- PA.18.** M. Kozłowski, S. Frackowiak, J. Macyszyn. "Double functionality of PLA nanocomposites"
- PA.19.** I. Navarro-Baena, L. Peponi, J.M. Kenny. "Crystallization study of di-block copolymers based on PLLA and PCL"
- PA.20.** J. Odent, J.M. Thomassin, Y. Habibi, J.M. Raquez, C. Jérôme, Ph. Dubois. "Synergy of ϵ -caprolactone based impact modifiers and silica nanoparticles for designing ultra-tough polylactide-based materials"
- PA.21.** M. Phiriyawirut, S. Aiba. "Effect of low molecular weight poly (di-n-alkyl itaconate) on morphology and thermal properties of polylactic acid/rice straw composites"
- PA.22.** M. Phiriyawirut, C. Phadsuwan, P. Suandokmai, P. Somsak. "Polylactic acid/chitin whisker nanocomposite films"
- PA.23.** R. Khankruea, S. Pivsa-Art, H. Hiroyuki, S. Suttiruengwong. "Effect of chain extenders on structural and mechanical properties of poly(lactic acid) melt-processed at high temperatures"
- PA.24.** C. Samuel, S. Barrau, G. Stoclet, J.M. Lefebvre, J.M. Raquez, P. Dubois. "Dual and multiple shape memory effects in miscible PLLA/PMMA blends"
- PA.25.** M.A. Shiraj, J. Zanela, C.M. Olivera-Müller, M.V.E. Grossmann, F. Yamashita. "Addition of carboxylic acids in poly(lactic acid)/thermoplastic starch sheets"
- PA.26.** M.A. Shiraj, G.M. Pereira, M.H. Kunita, A.F. Rubira, C.M. Olivera-Müller, M.V.E. Grossmann, F. Yamashita. "Thermal and mechanical properties of poly(lactic acid)/thermoplastic starch sheets"
- PA.27.** S. Jurczyk, M. Kwiecień, J. Rydz, P. Kurcok, M. Sobota. "Shape memory effect of the polylactides – poly([R,S]3-hydroxybutyrate) blends"



PA.28. C. Thongpin, K. Pongthanayuth. "Effect of organic peroxide on PLA modified by NR: Morphology, thermal stability and crystallization behavior"

PA.29. F. Ublekov, H. Penchev, V. Sinigersky. "Structure and properties of nonisothermal crystallized PHBV/PLLA nanocomposite blends"

PA.30. S. Yilmaz, M. Kodal, T. Yilmaz, G. Ozkoc. "Fracture behavior of O-POSS/PLA composites by using the essential work of fracture method"

PA.31. A. Kassouf, A. Ruellan, A. Guinault, J. Maalouly, D.N. Rutledge, V.Ducruet. "ATR-MIR spectroscopy coupled with independent components analysis for the identification of plasticizers in polylactide"



POSTER SESSION B (Tuesday 1st October, afternoon session)

PB.1. D. Rasselet, A. Ruellan, A. Guinault, G. Miquelard-Garnier, C. Sollogoub and B. Fayolle. "Thermo-oxidative degradation of polylactide (PLA) at low temperature: Physical & Mechanical aspects"

PB.2. A. Valdés, M. Ramos, A. Beltrán, M.C Garrigós. "Barrier properties and degradation characteristics of poly(ϵ -caprolactone)-based composites with almond skin residues"

PB.3. M.P. Arrieta, J. López, E. Rayón, A. Jiménez. "Disintegrability under composting conditions of plasticized PLA-PHB blends"

PB.4. M.P. Balaguer, S. Aucejo, R. Gavara, P. Hernández-Muñoz. "Compostability of cross-linked wheat protein films with antimicrobial properties"

PB.5. B. Boubekour, N. Belhaneche-Besemra, V. Massardier. "Biodegradation of low density polyethylene/poly (lactic acid)/floor wood composites"

PB.6. V.T. Phuong, I. Anguillesi, P. Cinelli, S. Verstichel, A. Lazzeri. "Cellulose diacetate blends – Effect of plasticizer on properties and biodegradability"

PB.7. L. Rueda, B. Fernandez d'Arlas, G. Kortabarria, A. Tercjak, M.A. Corcuera, A. Eceiza. "Biostability of polyurethanes. Study from the viewpoint of microphase separated structure"

PB.8. F. Freyermouth, N. Jacquél, F. Fenouillot, A. Rousseau, C. Ladavière. "Characterization of the hydrolytic degradation of poly(butylene succinate) under mild-ambient conditions and methods for limiting thereof"

PB.9. B. Gregorí, H. Ribeiro, J. Bordado, A. M. Anselmo. "Synthesis of polyurethanes and biodegradation studies"

PB.10. R. Lubczak, J. Lubczak. "Studies on biodegradation of new thermally resistant selfdistinguishing polyurethane foams"

PB.11. Č. Novotný, P. Erbanová, H. Sezimová, K. Malachová, L. Malinová, I. Prokopová, J. Brožek. "Screening of microorganisms for biodegradation of aromatic-aliphatic copolyesters and polyesteramides"

PB.12. M. Ramos, E. Fortunati, F. Dominici, M. Peltzer, A. Jiménez, M.C. Garrigós J.M. Kenny. "Degradation of nano-biocomposites based on active poly(lactic acid): Physical and thermal properties"



PB.13. R. Botet, A.M. Pelacho, Ll. Martin-Closas. “An in-vitro crop plant ecotoxicity test for agricultural bioplastic additives”

PB.14. J.B.A. da Silva, M.C. Branciforti, F.V. Pereira, C. Oliveira de Souza, J.I. Druzian. “Cassava starch-based films reinforced with cellulose nanowhiskers – Thermal properties and biodegradation”

PB.15. V Paul, K Kanny, G.G Redhi “Characterisation of a bio-composite made from banana fibres reinforced with a novel banana-sap based bio-resin”

PB.16. O. Gil-Castell, J.D. Badia, T. Kittikorn, E. Strömberg, A. Martínez-Felipe, M. Ek, S. Karlsson, A. Ribes-Greus. “Hydrothermal ageing of polylactide/sisal biocomposites. Studies of water absorption behaviour and physico-chemical performance”

PB.17. J.D. Badia, T. Kittikorn, E. Stromberg, L. Santonja-Blasco, A. Martínez-Felipe, A. Ribes-Greus, M. Ek. S. Karlsson. “Water absorption and hydrothermal performance of PHBV/sisal biocomposites”

PB.18. I. Egüés, O. Gordobil, C. Sánchez, A. Eceiza, J. Labidi. “Effect of different hemicelluloses characteristics on film forming properties”

PB.19. W. Sikorska, G. Adamus, M. Kowalczyk, J. Rydz, M. Musioł, M. Sobota. “Systemic approach for sustainable production for bioplastics - composting”

PB.20. K. Sotho, M. Seadan, S. Suttiruengwong. “Effect of glycerol and reactive compatibilizers on poly(butylene succinate)/starch blend”

PB.21. N. Suppakarn, S. Pholsai, S. Siwadamrongpong. “Effect of rice husk content on mechanical properties and flammability of rice husk / poly(butylene adipate-co-terephthalate) composites”

PB.22. L. Telen, P. Van Puyvelde, B. Goderis. “Protein based thermoplastic elastomers”

PB.23. V. Verney, H. Askanian, F. Leroux, M. Hennous, T. Stimpfling, G. Totaro, L. Sisti, A.M. Celli. “Intercalated fatty acids – layered double hydroxide nanohybrids as chain extenders for polybutylene succinate”

PB.24. M. Li, F. Xie, R.G Gilbert, P. Halley. “Effect of structure, processing and ageing on the mechanical characteristics of starch-based materials”

PB.25. P. Kangwanwatthanasiri, N. Suppakarn, C. Ruksakulpiwat, Y. Ruksakulpiwat. “Effect of cassava pulp on crystallization of PLA/PBS blends”

PB.26. J. Zanela, M. de Oliveira Reis, M.A. Shirai, S. Mali de Oliveira, M.V.E. Grossmann, F. Yamashita. “Mechanical and barrier properties of extruded cassava starch/polyvinyl alcohol films”



PB.27. A. Zychewicz, P. Lisowska, A. Kundys, M. Mazurek, Z. Florjanczyk, A. Plichta. "Poly(1,4-butylene carbonate-co-terephthalate) as macroinitiator in polymerization of lactide"

PB.28. C. Ferreira-Frias, J.F.J. Coelho, A.C. Serra. "Synthesis and characterization of products from Michael-addition reaction of acrylated Epoxidized soybean oil"

PB.29. M. Kwiecień, G. Adamus, M. Kowalczuk. "Controlled reduction of PHA and their synthetic analogues to corresponding oligodiols"

PB.30. Y. Hirata, K. Katsuta, K. Hamada. "Preparation of Poly(lactic acid)/Cellulose acetate blend membranes based on nanofiber nonwovens"

PB.31. V.M. De Benedictis, C. Demitri, A. Sannino. "Degradation kinetics of chitosan in acidic solution"



POSTER SESSION C (Wednesday 2nd October, morning session)

PC.1. A. Kundys, A. Plichta, A. Jóźwiak, Z. Florjańczyk. "Metal acetylacetonates as the tools for synthesis of diversified triblock copolymers consisting lactic acid units"

PC.2. F. Carosio, A. Di Basio, J. Alongi, A. Frache, G. Malucelli. "Layer by Layer deposition of renewable DNA-based flame retardant coatings on natural and biobased substrates"

PC.3. A. Chiappone, J. Nair, C. Gerbaldi, R. Bongiovanni, E. Zeno. "Paper based electrolytes for flexible lithium batteries applications"

PC.4. F. Coutinho de Paula, V. Rodrigues-Marin, J.G. Cabrera-Gomez, J. Contiero. "Poly(3-Hydroxybutyrate) production from biodiesel glycerol by *Cupriavidus metallidurans*"

PC.5. F. Coutinho de Paula, V. Rodrigues-Marin, J.G. Cabrera-Gomez, J. Contiero. "Poly(3-Hydroxybutyrate-co-3-Hydroxyvalerate) production from biodiesel glycerol and propionic acid by *Pandoraea* sp."

PC.6. M. Kanelli, A. Douka, S. Vouyiouka, C. Papaspyrides, E. Topakas, L.M. Papaspyridi, P. Christakopoulos. "Production of biodegradable polyesters via enzymatic polymerization and solid state finishing"

PC.7. P.L. Lima-Ribeiro, L.A.S. Costa, T. Villas-Boas, M. Inomata-Campos, C. Oliveira de Souza, J.I. Druzian. "Biosynthesis polyhydroxyalkanoate: Characterization and thermal spectroscopy"

PC.8. T.V. Boas-Figueiredo, M. Inomata-Campos, C. Oliveira de Souza, J.I. Druzian, B. Jean. "Surface functionalization of *eucaliptus* cellulose nanocrystals by grafting onto of polyetheramines side-chains"

PC.9. N. Ezekiel, G. Nurani, Q. Zhou, L. Berglund. "Resilin hydrogel nanocomposites bioinspired by insect structures"

PC.10. A. Gratia, D. Merlet, V. Le Diouren, V. Ducruet, C. Lythaud. "Development of spectroscopic methods to assess the composition of food contact materials: Use of NMR and mass spectrometry"

PC.11. D. Gamba, C. Weiss, C.L. Petzhold, K. Landfester. "Functionalized particles prepared with monomers derived from glycerol by inverse miniemulsion"

PC.12. D.M. Díaz-Vela, M.A. Rodríguez-Claros, J.A. Medina-Perilla. "Evaluation of acetylation and etherification in water absorption problem of thermoplastic starch"



PC.13. H. Shen, J. Chen, M. Taha. “Ring-opening copolymerization of caprolactone and glycidyl methacrylate and cross-linking of the issued copolymers”

PC.14. C.G. Jaffredo, J.F. Carpentier, S.M. Guillaume. “Organocatalyzed controlled ROP of β -lactones towards poly(hydroxyalkanoate)s PHAs (co)polymers”

PC.15. S. Lee, J. Shin, Y.W. Kim. “Renewable plasticizers from waste vegetable oil for flexible ethyl cellulose”

PC.16. M. Lamanna, N. Gabilondo, M.A. Corcuera, S. Goyanes. “Starch films crosslinked with citric acid”

PC.17. S. Laurichesse, L. Avérous. “Chemical modifications of lignin: Towards polymer synthesis”

PC.18. A. Arbenz, S. Laurichesse, L. Avérous. “Oxypropylation: Efficient polymerization process to obtain new biobased polyols for the development of innovative macromolecular architecture”

PC.19. F.V. Leimann, M.H. Biz, A. Musyanovych, K. Landfester, C. Sayer, P.H.H. de Araújo. “PHBV/PS polymer blend nanoparticles: Effect of molecular weight”

PC.20. M. Vanhalle, S. Corneillie, M. Smet, P. Van Puyvelde, B. Goderis. “Polypeptides as novel biomaterials: Morphology and thermal stability of polyalanine”

PC.21. M. Fabbri, M. Gigli, R. Gamberini, N. Lotti, M. Gazzano, B. Rimini, A. Munari. “Novel PBS-based fully aliphatic thermoplastic elastomers”

PC.22. S. Obruca, S. Petrik, J. Oborna, M. Pala, L. Eremka, I. Marova. “Production of polyhydroxyalkanoates from spent coffee grounds”

PC.23. S. Obruca, P. Benesova, V. Ondruska, I. Marova. “Production of pullulan and poly(β -L-malic acid) by *Auerobasidium Pullulans* using inexpensive carbon substrates”

PC.24. L. Peponi, K.A. Barrera-Rivera, I. Navarro-Baena, A. Marcos-Fernández, A. Martínez-Richa, J.M. Kenny. “Synthesis by biocatalysis of bio-degradable polymers based on lactide”

PC.25. H. Öztürk-Düşkünkorur, S. Duchiron, E. Pollet, V. Phalip, L. Avérous. “Enzymatic ring-opening polymerization of lactide stereoisomers catalyzed by lipases”

PC.26. A.F. Reano, F. Pion, S. Domenek, F. Allais. “Synthesis and evaluation of antiradical properties of new bio-based macrobisphenols derived from ferulic acid”

PC.27. Lu.B. Peres, La.B. Peres, O.H. Gonçalves, P.H.H. Hermes de Araújo, C. Sayer. “Preparation of PLLA/PS blend nanoparticles by miniemulsion polymerization technique”



PC.28. K. Songsurang, S. Nobukawa, M. Yamaguchi “Optical properties in solution-cast film of cellulose triacetate”

PC.29. N. Muikaew, K. Chawkondee, W. Choeykhunthod, S. Hemsri, C. Thongpin. “Toughened biopolymer blend of wheat gluten and modified natural rubber”

PC.30. K. Twarowska-Schmidt, S. Dutkiewicz, G. Maciejewski. “Investigation in the manufacture of fibres from biodegradable aliphatic – aromatic polyester”

PC31. F. Cerrone, S. Choudhari, R. Davis, D. Cysneiros, V. O’Flaherty, R.P. Babu, K. O’Connor. “Grass material conversion to fermentable VFAs for MCL-polyhydroxyalkanoates production”

PC32. N. Jacquel, R. Saint-Loup, A. Rousseau, J.P. Pascault, F. Fenouillot-Rimlinger. “Poly(butylene succinate) with improved melt viscosity for extrusion blowing of thin films”



POSTER SESSION D (Wednesday 2nd October, afternoon session)

- PD.1.** F. Ansari, R. Rojas. “Reinforcing effect of lignin in an epoxy matrix”
- PD.2.** E. Benavent, B. Galindo, O. Menes, A. Pascual, F. Marti. “Non-chemical modified thermoplastic starch to be used in co-injection packages”
- PD.3.** C. Menzel, E. Olsson, R. Andersson, C. Johansson, L. Järnström, K. Koch. “Improvement and characterization of citric acid cross-linked starch barriers”
- PD.4.** C. Carré, L. Avérous. “Development of new healthy and environmental friendly polyurethanes”
- PD.5.** L.M. Chiacchiarelli, I. Puri, M. Rallini, A. Vazquez, J.M. Kenny, L. Torre. “Improving physical crosslinking of silica polyurethane bio-based nanocomposites by grafting methods”
- PD.6.** P.P. Danilovas. “Thermal stability of cationic starches and their complexes with iodine”
- PD.7.** A. Domanska, A. Boczkowska. “Biodegradable polyurethanes from crystalline prepolymers”
- PD.8.** E. Lekniute, J. Bendoraitiene. “Flocculation properties of cationic starch dependence on the degree of substitution”
- PD.9.** A. Saralegi, A. Arbelaiz, L. Martin, M.A. Corcuera, A. Eceiza. “Vegetable oil based thermoplastic polyurethanes: Influence of ageing at room temperature”
- PD.10.** E. Fages, S. Girones, T. Boronat, L. Sanchez-Nacher, R. Balart. “Study of the curing process of ELO and ESBO resins”
- PD.11.** A. Frache, F. Carosio, D. Battegazzore. “A classification of biopolymers and biocomposites in terms of flame retardancy”
- PD.12.** Y. Fukui, S. Nobukawa, M. Yamaguchi. “Strong enhancement of orientation birefringence for cellulose ester by low-mass additives”
- PD.13.** C. García-Astrain, A. Gandini, C. Peña, A. Eceiza, M.A. Corcuera, N. Gabilondo. “Characterization of furan functionalized gelatin hydrogels cross-linked through an aqueous Diels-Alder reaction”
- PD.14.** K.J.A. Jansens, N. Vo Hong, L. Telen, B. Lagrain, K. Brijs, A.W. Van Vuure, K. Van Acker, I. Verpoest, P. Van Puyvelde, B. Goderis, M. Smet, J. Delcour. “Wheat gluten cross-linking and its importance for the mechanical properties of rigid bioplastics”



- PD.15.** S. Kalia, A. Celli, M. Vannini, G. Totaro, G. Zanaroli, A. Negroni, E. Frollini. "Reinforcing potential of enzymatic treated curaua fibers"
- PD.16.** M. Božič, M. Majerič, V. Kokol. "Micro-to-nano-structured soy-protein-based bioplastic"
- PD.17.** T.M. Lacerda, A.J.F. Carvalho, A. Gandini. "The remarkable potential of tung oil as a source of polymers based on the *Diels-Alder* click reaction"
- PD.18.** P. Lisowska, A. Zychewicz, A. Kundys, A. Plichta, Z. Florjańczyk. "Coupling reactions of biodegradable diol end-capped polyesters"
- PD.19.** J. Medina, L.M. Castro. "Synergic analysis of mechanical and water adsorption properties of wood-PVC composites"
- PD.20.** M. Monti, H. Hoydonckx, F. Stappers, G. Camino. "Furan resin - A bio-based thermosetting polymer: Cure kinetics, thermal and combustion behaviour"
- PD.21.** D.Puglia, E. Fortunati, F. Luzi, L. Torre, C. Santulli, J.M. Kenny. "Effect of cellulose nanocrystals extracted from phormium leaves on the final properties of limonene modified PLA films"
- PD.22.** V.K. Rastogi, H. Taheri, P. Samyn. "A novel production method for hydrophobized microfibrillated cellulose"
- PD.23.** R. Ramli, M.D.H. Beg, R.M. Halim, A.A. Aziz, J. Goh, H.U. Zaman, Z. Ibrahim. "Effect of surface treatments on tensile properties of oil palm empty fruit bunch fibers"
- PD.24.** R. Ramli, M.D.H. Beg, S. Kormin, H. Zaman. "Effects of different types of starch on tensile and impact properties of LDPE/starch blend"
- PD.25.** K. Pietrzak, M. Kirpluks, U. Cabulis, J. Ryszkowska. "Polyurethanes from tall oil based polyols with the addition of diethanolamine"
- PD.26.** K. Pietrzak, M. Kirpluks, U. Cabulis, J. Ryszkowska. "Polyurethanes from tall oil based polyols with the addition of triethanolamine"
- PD.27.** A. Sequeiros, M. González, D.A. Gatto, J. Labidi, L. Serrano. "Lignin liquefaction under microwave heating"
- PD.28.** H. Taheri, V.K. Rastogi, P. Samyn. "Production and rheology of microfibrillated cellulose (MFC) dispersions under different homogenization conditions"
- PD.29.** T.D.I Langstraat, K. Jansens, J. Delcour, B. Goderis. "Structural and chemical changes upon treating wheat gluten in superheated water"



PD.30. M. Vandesteene, F. Fenouillot, A. Rousseau, N. Boucard. “Synthesis and characterization of branched poly(butylene succinate) for fiber spinning: A comparative study”

PD31. R. Saint-Loup, N. Jacquelin, “From starch and starchy products to polymeric materials”



POSTER SESSION E (Thursday 3rd October, morning session)

- PE.1.** M.P. Arrieta, E. Fortunati, F. Dominici, E. Rayón, J. López, J.M. Kenny. “Plasticized PLA-PHB blends reinforced with cellulose nanocrystals”
- PE.2.** D. Battegazzore, J. Alongi, A. Frache. “Natural fillers for the preparation of biocomposites with enhanced performances”
- PE.3.** P.K. Bipinbal, M. Claudino, M. Johansson, L. Berglund. “Functionalized silica reinforced natural rubber nanocomposites”
- PE.4.** B. Bittmann, R. Bouza, L. Barral. “Thermal properties of PHBV/PBAT blends for packaging applications”
- PE.5.** J.E. Bruna, L. Esponiza, H. Quilodran, M.J. Galotto, A. Guarda, F. Rodríguez. “Development of eco-nanocomposites based on MtCu/PLA with antimicrobial activity”
- PE.6.** A. Chiappone, F. Bella, C. Gerbaldi, J. Nair, R. Bongiovanni. “Nanoscale microfibrillated cellulose reinforced polymer electrolytes for sustainable energy devices”
- PE.7.** A.G. Cunha, J.B. Mougel, B. Cathala, L. Berglund, I. Capron. “Nanocelluloses as promising bio-based emulsifiers for double emulsions”
- PE.8.** C. Djahedi, M. Bergensträhle-Wohlert. “Mechanical moduli of cellulose – Structure and forcefield dependence?”
- PE.9.** A. Duval, S. Molina-Boisseau, C. Chirat. “Use of different lignin to improve properties of wheat gluten-based materials”
- PE.10.** Ph. Evon, I. Amalia-Kartika, L. Rigal. “New renewable and biodegradable particleboards from *Jatropha* press cakes”
- PE.11.** E. Espino-Pérez, S. Domenek, J. Bras, G. Almeida. “Sorption behaviour and gas barrier properties of materials based functionalized cellulose nanocrystals”
- PE.12.** F.J. Rodríguez, J.C. Sáez, M.J. Galotto, A. Guarda, J.E. Bruna, P.E. Moya. “Development of active cellulose acetate nanocomposites using a melt process”
- PE.13.** J. González-Ausejo, E. Sánchez-Safont, J.Gámez-Pérez, L. Cabedo. “Development and characterization of PHBV-clay nanocomposites by melt blending with improved thermal stability”
- PE.14.** G. Mondragon, S. Campo, C. Peña, A. Eceiza, A. Arbelaiz. “Gelatin-based nanobiocomposites combined with cellulose nanoentities”



- PE.15.** R.A. da Silva-Buzanello, M.F. de Souza, A.C. Ferro, L. Cardozo-Filho, P.H.H. de Araújo, C. Sayer, F.V. Leimann, O.H. Gonçalves. “Characterization of curcumin-loaded biodegradable/biocompatible nanoparticles”
- PE.16.** J. Al Hakkak, K. Kathirgamanathan, N.R Edmonds, W. Grigsby. “New method for the preparation of spherical cellulose nano-particles”
- PE.17.** J. Urquijo, G. Guerrica-Echevarría, J.I. Eguiazábal. “Semiconductive PLA/PCL/MWCNT nanocomposites with high mechanical performance”
- PE.18.** S. Kalia, A. Celli, F. Di Credico, M. Vannini, G. Totaro, A. Tassoni, M. Lamborghini. “Potential use of rice endosperm fibers as reinforcing material in biocomposites”
- PE.19.** K. González, A. Retegi, S. Goyanes, A. González, A. Eceiza, N. Gabilondo. “Starch and cellulose nanocrystals together into thermoplastic starch bionanocomposites”
- PE.20.** E. Roumeli, D. Bikiaris, K. Chrissafis. “Thermal decomposition mechanism of crosslinked high density polyethylene nanocomposites with multi-walled carbon nanotubes as green material for geothermal applications”
- PE.21.** J.B. da Silva, J. Druzian, F. Vargas-Pereira, C.A.G. Beatrice, J. Marini, R.E.S. Bretas, A. de A. Lucas. “SAXS measurements of PBAT/TPS blends and its nanocomposites with cellulose nanocrystals”
- PE.22.** D.E.S. Sousa, C.P. Silva, A. de A. Lucas. “Morphology, mechanical and electrical properties of PLA/PBS blends and their nanocomposites with expanded graphite”
- PE.23.** N. Butchosa, F. Leijon, V. Bulone, Q. Zhou. “Cellulose nanofibrils from primary plant cell wall”
- PE.24.** M. Monti, M. Zaccone, D. Puglia, J.M. Kenny. “Lignin as a filler for PHB composites”
- PE.25.** M.R. Khan, M.N.K. Chowdhury, M.D.H. Beg, R.M. Yunus. “Development of Cu nanoparticle loaded natural fibre reinforced polyester resin nanocomposite”
- PE.26.** U. Pérez de Larraya, H.Sehaqui, J. Estella, P. Tingaut, T. Zimmermann. “Nanocellulose membranes with antifouling properties for water purification technologies”
- PE.27.** K. Prakobna. “Effects of interface tailoring in core-shell cellulose nanofibre/amylopectin composites”
- PE.28.** N. Rescignano, E. Fortunati, I. Armentano, J.M. Kenny. “Synthesis and characterization of PLGA nanoparticles obtained by three natural surfactants”



PE.29. C. Ruksakulpiwat, S. Thankratoke, S. Yamkaew, Y. Ruksakulpiwat. “Starch and silica as reinforcing fillers in glycidyl methacrylate grafted natural rubber composites”

PE.30. M. Salajková. “Hydrophobic cellulose nanocrystals and their application in nanocomposite materials”

PE.31. D. De Smet, M. Vanneste. “Biomaterials in textile coating and finishing”

PE.32. D. Puglia, R. Petrucci, E. Fortunati, J.M. Kenny, L. Torre. “Revalorization of coastal algae wastes in textile nonwoven industry with applications in building noise isolation”



POSTER SESSION F (Thursday 3rd October, afternoon session)

PF.1. A. Mújica-García, L. Peponi, J.M. Kenny. "Influence of the processing parameters on the electrospun fibers of bio-polymers"

PF.2. A.C.K. Bierhalz, M.A. da Silva, T.G. Kieckbusch. "Antimicrobial properties of alginate and pectin films incorporated with natamycin"

PF.3. A. Valdés, N. Juárez, A. Beltrán, M.C. Garrigós, "Development and characterization of poly(ϵ -caprolactone) active films by using natural almond skin extracts as potential antioxidants source"

PF.4. A. Kassouf, V.Ducruet, J. Maalouly, H. Chebib, L. Eveleigh, D.N. Rutledge. "Rapid discrimination of plastics using ATR-MIR spectroscopy coupled with independent components analysis (ICA)"

PF.5. A.Beltrán, M. Gallur. "New sustainable coating for food packaging based on starch and seaweed extracts (PLANTPACK)"

PF.6. H. Askanian, Y. Feng, S. Commerreuc, J.M. Andanson, M. Costa-Gómez, V. Verney. "Dissolution-regeneration of wood: Effect of particle size of wood on the properties of wood-polymer composites"

PF.7. F. Cerullo, L. Cutaia, F. La Marca, G. Barberio. "Comparative LCA of plastic, bioplastic and additivated plastic"

PF.8. I. Fernández-Pan, J.I. Maté, V. Coma. "Effect of chitosan molecular weight on the release rate and antimicrobial activity of carvacrol enriched films"

PF.9. B. De Benedetti, P. Frenj, P. Tecchio, G. Camino. "New bio-based materials as substitute of oil-based ones: An innovative eco-selection approach"

PF.10. M.J. Galotto, R. Quintero, A. Torres, J. Romero, J. Bruna, A. Guarda. "Barrier, Mechanical and antimicrobial behaviour of cellulose acetate butyrate nanocomposites for food packaging"

PF.11. A. Guarda, R. Quintero, A. Torres, J. Romero, F.J. Rodriguez, M.J. Galotto. "Kinetic release of carvacrol from cellulose acetate butyrate antimicrobial nanocomposites for food packaging"

PF.12. T. Huang, S. Nobukawa, M. Yamaguchi. "Structure and properties of poly(lactic acid) plasticized by poly(ethylene glycol)"



PF.13. Y.B. Brandao, L.A. Ferreira, G.G. Pieretti, M.R. da Silva Scapim, F. Yamashita, G.S. Madrona. "Active packaging using oregano oil (*Origanum vulgare*) and its application in butter"

PF.14. A. Minesso, R. Cavalieri, C. Gioia, M. Vannini, P. Marchese, M. Colonna, A. Celli. "Sustainable polyesters for powder coating"

PF.15. F. Morena, I. Armentano, C. Barola, S. Montesano, E. Fortunati, S. Mattioli, I. Bicchi, A. Bianco, J.M. Kenny, C. Emiliani, S. Martino. "Tuning Stem Cells Fate by PLLA-based materials: A Matter of Mechanotransduction"

PF.16. K.K.N.C. Lins Perazzo, C. Oliveira de Souza, V.C. Santos-Ebinuma, D. de Jesus Assis, J.I. Druzian. "Monitoring the oxidative stability of butter packaged in active films based on green tea extract and colorant carotenoid"

PF.17. S.K.Pankaj, C.Bueno-Ferrer, N.N.Misra, L.O'Neill, A. Jiménez, P. Bourke, P.J. Cullen. "Effects of dielectric barrier discharge atmospheric plasma on antimicrobial zein film"

PF.18. D. Rusu, A. Piröelle, M.F. Lacrampe, C. Henneuse, P. Krawczak, V. Ducruet. "Volatile organic compounds from the thermodegradation of polylactide during processing: Extrusion and thermoforming"

PF.19. K. Salasinska, M. Polka, J. Ryszkowska. "Composites from PE-HD foil and pistachio shell or sunflower husk: Effect of chemical structure and filler content on the dimensional and fire stability"

PF.20. G.S. Madrona, M.R. da Silva Scapim, L.A. Cestai, M.S. dos Santos Pozza, F. Yamashita. "Active packaging on mozzarella cheese"

PF.21. H. Shimada, K. Songsurang, S. Nobukawa, M. Yamaguchi. "Effect of hydrogen bonding on optical anisotropy of cellulose esters"

PF.22. K. Songsurang, S. Nobukawa, M. Yamaguchi. "Optical properties in solution-cast film of cellulose triacetate"

PF.23. M.A. Souza, K. Sakamoto, J.E. Oliveira, E.S. Medeiros, L.H.C. Mattoso. "Delivery control of anti-inflammatory drugs using nanostructured membranes of poly(3-hydroxybutyrate-co-3-hydroxyvalerate) obtained by solution blow spinning"

PF.24. M. Roussaki, A. Gaitanarou, S. Vouyiouka, C. Papaspyrides, A. Detsi. "Encapsulation of bioactive molecules in biodegradable PLA nanoparticles"

PF.25. A. Passos-Dias, J. Camisa¹, L.S. Sakanaka, F. Yamashita. "Barrier properties, mechanical and microstructural characterization of oat flour, poly(butylene adipate co-



terephthalate) and glycerol biodegradable films prepared by extrusion–calendering process”

PF.26. J.B. Olivato, J. Marini, F. Yamashita, M.V.E. Grossmann, L. Avérous. “Thermoplastic starch / polyester nano-biocomposites with sepiolite clays”

PF.27. M. Zaccone, M.T. Scrivani, M.R. Contardi, M. Monti. “PLA – Mg/Al hydrotalcite films for food packaging applications”

PF.28. M. Oliveira-Reis, J. Zanela, P. Salomão-Garcia, F. Yamashita, M.V.E. Grossmann. “Influence of microcrystalline cellulose in starch/poly (butylene adipate co-terephthalate) blown films”

PF.29. M. Zieleniewska, M. Auguścik, A. Prociak, P. Rojek, J. Ryszkowska. “Polyurethane substrates from rapeseed oil-based polyol for bone tissue cultures intended for application in tissue engineering”

PF30. E.M. Soares-Latour, J. Bernard, S. Chambert, E. Fleury, N. Sintès-Zydowicz. “Environmentally benign synthesis of 100% bio-based polyamide microcapsules”