

Carbohydrate Polymers

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Edited by Dr.Carmen G. Boeriu, Dr.Jan E.G van Dam and Dr.Henk A. Schols

Special Issue Title Page

Page vi

Polysaccharides as source of advanced and sustainable products

Page 1

Carmen G. Boeriu

The European Polysaccharide Network of Excellence (EPNOE)

Page 2

Patrick Navard

Sustainability, polysaccharide science, and bio-economy

Original Research Article

Pages 3-8

René ten Bos, Jan E.G. van Dam

Highlights

► The role and responsibility of polysaccharide scientists was reflected upon. ► PS science was placed in the context of actual global issues like bio-economy. ► Difficulties in communication between parties involved and public was addressed. ► Change in relations between science and public is needed. ► PS science has to go beyond the specialist horizon and is key in those transitions.

Section 1: Sources of functional polysaccharides

The cellulose resource matrix

Original Research Article

Pages 9-21

Edwin R.P. Keijsers, Gülden Yılmaz, Jan E.G. van Dam

Highlights

► Cellulose resources were categorized and classified according technical parameters. ► Conversion processes were classified according processing parameters and economics. ► Markets of lignocellulosics were characterized according market requirements. ► Data sets of properties, processing and markets are clustered as matrix structure. ► The cellulose resource matrix is a ICT tool for information and data management.

Structural features of two heteroxylan polysaccharide fractions from wheat bran with anti-complementary and antioxidant activities

Original Research Article

Pages 22-30

Zdenka Hromádková, Berit Smestad Paulsen, Martin Polovka, Zuzana Košťálová, Anna Ebringerová

Highlights

► Isolation of arabinoxylans from wheat bran by enzymic treatment and dilute alkali. ► Chemical, FTIR and 1D- and 2D-NMR spectroscopy served for structural analysis. ► The arabinoxylans were contaminated with (1 → 3,1 → 4)-β-glucan and arabinogalactan. ► Both arabinoxylans contained phenolic compounds, the second one also protein. ► The arabinoxylans displayed antioxidant activities and immuno-enhancing effects.

Section 2: Biosynthesis, enzymatic degradation and modification of polysaccharides

Synthesis of branched polysaccharides with tunable degree of branching

Original Research Article

Pages 31-37

Jelena Ciric, Katja Loos

Highlights

► Branched polyglucans are synthesized by the use of enzymes from the transferase family. ► The synthesis results in branched polyglucans with tuneable degree of branching. ► Different degrees of branching are best regulated by the reaction time. ► The obtained polymers are pure and easily dissolve in water.

Production methods for heparosan, a precursor of heparin and heparan sulfate

Original Research Article

Pages 38-47

Anaïs A.E. Chavaroche, Lambertus A.M. van den Broek, Gerrit Eggink

Highlights

► Heparosan chain length and the sugar unit backbone composition determine the biological activity of heparin and heparan sulfate. ► Different methods used to synthesize heparosan are reviewed. ► The use of biocatalysts *in vitro* is the most promising method to produce defined heparosan polymers. ► *P. multocida* heparosan synthase PmHS2 appears to be the most adequate biocatalyst. ► Advancements in the field of the synthesis of bioengineered heparin are also reported.

Tailor-made fructan synthesis in plants: A review

Review Article

Pages 48-56

Jeroen van Arkel, Robert Sévenier, Johanna C. Hakkert, Harro J. Bouwmeester, Andries J. Kooops, Ingrid M. van der Meer

Highlights

► Modification of fructan biosynthesis in chicory showed to have little effect. ► The fructan biosynthesis pathway can be transferred to non-fructan-accumulating plants. ► Tailor-made fructan can be synthesized in originally non-fructan-producing plants. ► The fructan chain length distribution of tailor-made fructan is dependent on FFT. ► High potential crops for tailor-made fructan production are sugar beet, sugarcane and rice.

Comparative analysis of production and purification of homo- and hetero-polysaccharides produced by lactic acid bacteria

Original Research Article

Pages 57-64

Sara Notararigo, Montserrat Nácher-Vázquez, Idoia Ibarburu, M^a Laura Werning, Pilar Fernández de Palencia, M^a Teresa Dueñas, Rosa Aznar, Paloma López, Alicia Prieto

Highlights

► Three different polysaccharides were produced by 4 different lactic acid bacteria strains. ► Different methods were developed to purify the bacterial polysaccharides. ► After purification they were used for structural analysis. ► After structural analysis they were identified as homo and heteropolysaccharides.

Enzymatic synthesis of oligo- and polysaccharide fatty acid esters

Original Research Article

Pages 65-72

Lambertus A.M. van den Broek, Carmen G. Boeriu

Highlights

► Lipases and proteases are used for the synthesis of carbohydrate fatty acid esters. ► Immobilisation improves enzyme activity in organic solvents. ► Super critical fluids and ionic liquids can be used for enzymatic esterification. ► Enzymatic esterified oligo- and polysaccharides have improved functionalities.

Oxidation and degradation of native wheat starch by acidic bromate in water at room temperature

Original Research Article

Pages 73-80

Sanna Komulainen, Christof Verlackt, Jouni Pursiainen, Marja Lajunen

Highlights

► We have showed that bromate oxidation at room temperature produced water-soluble oxidized starch. ► Reaction time and concentration effect to oxidation degree and length of the chain. ► NMR studies indicated that oxidized groups were in C-2, C-3 and C-6 positions. ► HPLC-ELSD verified the degradation of starch under oxidation.

Optimization of hydrolysis conditions for the production of glucomanno-oligosaccharides from konjac using β -mannanase by response surface methodology

Original Research Article

Pages 81-88

Junfan Chen, Desheng Liu, Bo Shi, Hai Wang, Yongqiang Cheng, Wenjing Zhang

Highlights

► The change in the direct reducing sugar (DRS) is consistent with total reducing sugar (TRS) but contrary to the degree of polymerization (DP). ► DRS could be used as an indicator of the content of GMO in the RSM study. ► The optimum RSM operating conditions were: reaction time of 3.4 h, reaction temperature of 41.0 °C, pH of 7.1 and enzyme to substrate ratio (E/S) of 0.49. ► The enzymatic hydrolysis was enhanced by temperature, pH and incubation time.

Dissolution and depolymerization of barley starch in selected ionic liquids

Original Research Article

Pages 89-94

Katja Lappalainen, Johanna Kärkkäinen, Marja Lajunen

Highlights

► Ten ILs were studied for dissolution and depolymerization purposes of starch. ► Rate of the reaction is affected by the structure of the cation and the anion of IL. ► Imidazolium halides dissolve and depolymerize starch fast to starch oligomers. ► Formates dissolve starch more slowly than halides and the products are larger. ► [EMIM][Me₂PO₄] and [NH₃CH₂CH₂OH][HCOO] dissolve well but depolymerize only slightly.

Utilization of corn steep liquor for biosynthesis of pullulan, an important exopolysaccharide

Original Research Article

Pages 95-101

Nishat Sharma, G.S. Prasad, Anirban Roy Choudhury

Highlights

► Five agri-industrial wastes were evaluated for their use as sole nitrogen source. ► Process optimization yielded 88.59 g L⁻¹ pullulan using CSL as sole nitrogen source. ► Use of CSL as nitrogen source has significant effect on cost of the final product. ► This may leads to development of cost effective technology for pullulan production. ► May also help in value addition and waste management of corn-starch industries.

Enzyme-aided alkaline extraction of oligosaccharides and polymeric xylan from hardwood kraft pulp

Original Research Article

Pages 102-108

Terhi K. Hakala, Tiina Liitiä, Anna Suurnäkki

Highlights

► Combination of enzyme and alkaline treatments were used to fractionate kraft pulp. ► High yield and high MW xylan were obtained by sequential alkaline extraction. ► Xylanase treatment was used to isolate xylo-oligosaccharides. ► Reduction of cellulose DP by endoglucanase was enhanced by xylan removal.

Effect of carboxymethyl groups on degradation of modified pullulan by pullulanase from *Klebsiella pneumoniae*

Original Research Article

Pages 109-115

Ghina Ali, Christophe Rihouey, Didier Le Cerf, Luc Picton

Highlights

► Pullulanase type I degrades pullulan to give maltotriose. ► Pullulan grafting by carboxymethyl groups is resistant to this enzymatic treatment. ► The resistant is favored by high substitution of pullulan.

Starch modification with microbial alpha-glucanotransferase enzymes

Original Research Article

Pages 116-121

Marc J.E.C. van der Maarel, Hans Leemhuis

Highlights

► Enzymes can replace chemical modification to synthesize resistant starches. ► α -Glucanotransferases modify starch structures without decreasing molecular weight. ► Starches are converted in thermoreversible starch gels by 4- α -glucanotransferases. ► α -Glucanotransferases are increasingly used to make value-added starch derivatives.

Section 3: Physical, chemical and structural characterisation of polysaccharides

Novel insight into cellulose supramolecular structure through ^{13}C CP-MAS NMR spectroscopy and paramagnetic relaxation enhancement

Original Research Article

Pages 122-128

Gerhard Zuckerrstatter, Nicoleta Terinte, Herbert Sixta, Kurt Christian Schuster

Highlights

► Solvent accessibility in cellulose is evidenced and monitored through ^{13}C T_1 NMR relaxation enhancement in paramagnetic medium. ► Established NMR signal assignments for cellulose I have been confirmed. ► Existing cellulose II resonance attributions have been modified and extended. ► Novel spectral fitting routines for cellulose II have been presented. ► A model for cellulose II supramolecular structure has been established.

Perichromism: A powerful tool for probing the properties of cellulose

and its derivatives

Original Research Article

Pages 129-134

Ludmila C. Fidale, Thomas Heinze, Omar A. El Seoud

Highlights

► Using perichromic indicators for investigating cellulose and its derivatives. ► Perichromism is a simple and powerful tool to gain information on the medium. ► Provides information on polarity, acidity, basicity, dipolarity/polarizability. ► Perichromic properties correlate well with DS of cellulose derivatives.

Heat stress causes alterations in the cell-wall polymers and anatomy of coffee leaves (*Coffea arabica* L.)

Original Research Article

Pages 135-143

Rogério Barbosa Lima, Tiago Benedito dos Santos, Luiz Gonzaga Esteves Vieira, Maria de Lourdes Lúcio Ferrarese, Osvaldo Ferrarese-Filho, Lucélia Donatti, Maria Regina Torres Boeger, Carmen Lúcia de Oliveira Petkowicz

Highlights

► Yields, monosaccharide composition and molar mass profiles of cell-wall polysaccharides from coffee leaves changes when submitted to heat stress. ► The primary monolignol contents in coffee leaves increased after the heat stress. ► Cell anatomy of coffee leaves change under heat stress.

Property evaluations of dry-cast reconstituted bacterial cellulose/tamarind xyloglucan biocomposites

Original Research Article

Pages 144-153

Clayton F. de Souza, Neoli Lucyszyn, Marco A. Woehl, Izabel C. Riegel-Vidotti, Redouane Borsali, Maria Rita Sierakowski

Highlights

► Mechanical defibrillation of bacterial cellulose and incorporation of XG are presented. ► The newly developed composites are more hydrophobic than native bacterial cellulose. ► Bacterial cellulose/xyloglucan interaction changes crystallographic features of BC. ► Bacterial cellulose/tamarind xyloglucan film (XGT 10 wt%) have improved mechanical properties.

Structural features and bioremediation activity of an exopolysaccharide produced by a strain of *Enterobacter ludwigii* isolated in the Chernobyl exclusion zone

Original Research Article

Pages 154-162

Corinne Pau-Roblot, Michelle Lequart-Pillon, Ludovic Apanga, Serge Pilard, Josiane Courtois, Nathalie Pawlicki-Jullian

Highlights

► *Enterobacter ludwigii* Ez-185-17, isolated from a root nodule of a Medicago plant, produced a charged exopolysaccharide. ► Using NMR and spectrometry data, the EPS was found to be composed of galactose, glucose, fucose, glucuronic acid (2:1:2:1). ► The EPS revealed the ability to bind cadmium ions in the soil.

Structural diversity of pectins isolated from the Styrian oil-pumpkin (*Cucurbita pepo* var. *styriaca*) fruit

Original Research Article

Pages 163-171

Zuzana Košťálová, Zdenka Hromádková, Anna Ebringerová

Highlights

► Several pectic polysaccharides were isolated from oil-pumpkin fruit biomass. ► Homogalacturonan and rhamnogalacturonan regions were present in all fractions. ► Pectins were slightly acetylated and contain β -(1,4)-d-galactan chains. ► NMR chemical shifts of esterified and free galacturonic acid were clearly assigned. ► The primary structural features of pumpkin pectins were at first determined.

HE Section 4: Properties and functionality of polysaccharides

Influence of TEMPO-oxidized cellulose nanofibril length on film properties

Original Research Article

Pages 172-177

Hayaka Fukuzumi, Tsuguyuki Saito, Akira Isogai

Highlights

► TEMPO-oxidized cellulose nanofibrils (TOCNs) with different fibril lengths were prepared by controlling disintegration conditions in water. ► Degrees of polymerization of the TOCNs

corresponded well to the TOCN fibril lengths. ► Self-standing TOCN films and TOCN-coated PLA or PET films were prepared from the TOCNs. ► Films prepared from longer TOCN fibril lengths had higher tensile strength and oxygen barrier properties.

Molecular weight distribution analysis by ultracentrifugation: Adaptation of a new approach for mucins

Original Research Article

Pages 178-183

Richard B. Gillis, Gary G. Adams, Bettina Wolf, Monica Berry, Tabot M.D. Besong, Anthony Corfield, Samil M. K ok, Ray Sidebottom, David Lafond, Arthur J. Rowe, Stephen E. Harding

Highlights

► New method for molecular weight distribution. ► Conversion from sedimentation coefficients using power law. ► Special adaptation for mucins from database. ► Successful application to human gastric mucin in different solvents. ► Free of columns and membranes.

Synthesis of alkylated potato starch derivatives and their potential in the aqueous solubilization of benzo[a]pyrene

Original Research Article

Pages 184-190

Ana-Maria Rosu, Catherine Rafin, Gheorghe Surpateanu, Gheorghe Brabie, Doru Neculai Miron, Etienne Veignie

Highlights

► Modified potato starch was synthesized by alkylation. ► The chemical structural characteristics were investigated by NMR and FTIR. ► The ether modified starches present a higher aqueous solubility. ► The alkyl succinic anhydrides starches present high capacity to desorb benzo[a]pyrene.

Enzymatic digestion of partially and fully regenerated cellulose model films from trimethylsilyl cellulose

Original Research Article

Pages 191-198

Tamilselvan Mohan, Rupert Kargl, Aleř Doliřka, Heike M.A. Ehmman, Volker Ribitsch, Karin Stana-Kleinschek

Highlights

► The enzymatic digestion of thin cellulose films regenerated from trimethylsilyl cellulose was studied. ► A quartz crystal microbalance (QCM) and capillary zone electrophoresis were applied. ► Surface analytical techniques were compared with the enzymatic digestion rates. ► The rate of regeneration correlated well with the digestibility. ► QCM and capillary zone electrophoresis are useful to determine the rate of regeneration.

Dissolution of unmodified waxy starch in ionic liquid and solution rheological properties

Original Research Article

Pages 199-206

Weiqing Liu, Tatiana Budtova

Highlights

► Starch granule dissolution in EMIMAc is studied and compared with gelatinisation in water. ► Amylopectin intrinsic viscosity in EMIMAc is determined as a function of temperature. ► Cellulose is much more temperature sensitive than starch. ► Activation energy is power-law dependent on starch concentration.

Section 5: Design and manufacture of polysaccharides and derived structures

Oxidized cellulose—Survey of the most recent achievements

Original Research Article

Pages 207-215

Sergiu Coseri, Gabriela Biliuta, Bogdan C. Simionescu, Karin Stana-Kleinschek, Volker Ribitsch, Valeria Harabagiu

Highlights

► The recent advances on selective oxidation of cellulose are described. ► TEMPO oxidation of cellulose, occurs mainly at primary OH groups. ► Non persistent nitroxyl radicals are efficient and selective mediators for cellulose oxidation. ► Development of new *ecologically friendly* protocols for the oxidation of polysaccharides are required.

Syntheses and detailed structure characterization of dextran carbonates

Original Research Article

Pages 216-223

Thomas Elschner, Holger Wondraczek, Thomas Heinze

Highlights

- ▶ Synthesis of dextran alkyl carbonates applying different acylating agents. ▶ Study on reaction efficiency and the substitution pattern. ▶ Pathways to unconventional dextran carbonates of pharmacological interest. ▶ Structure of biopolymer derivatives clearly described.
- ▶ Specific substitution pattern depending on acylating agent used.

Section 6: Food and feed applications of polysaccharides

Influence of lysophosphatidylcholine on the gelation of diluted wheat starch suspensions

Original Research Article

Pages 224-231

S. Ahmadi-Abhari, A.J.J. Woortman, R.J. Hamer, A.A.C.M. Oudhuis, K. Loos

Highlights

- ▶ We study the influence of LPC on structural properties of wheat starch suspensions. ▶ The influence of LPC on the starch gelation was examined at different concentrations. ▶ LPC at low concentrations hinders swelling while preserving starch functionality. ▶ LPC at high concentrations blocks functional properties of wheat starch.

Influence of a diet rich in resistant starch on the degradation of non-starch polysaccharides in the large intestine of pigs

Original Research Article

Pages 232-239

Melliana C. Jonathan, Daniëlle Haenen, Carol Souza da Silva, Guido Bosch, Henk A. Schols, Harry Gruppen

Highlights

- ▶ Resistant starch delays the utilisation of non-starch polysaccharides. ▶ Resistant starch alters the carbohydrate-degrading-enzyme profile in large intestine. ▶ The production of microbial enzymes is induced by substrate availability in caecum.

Section 7: Polysaccharides in cosmetic, pharmaceutical and medical applications

AFM characterization of spin coated carboxylated polystyrene nanospheres/xyloglucan layers on mica and silicon

Original Research Article

Pages 240-245

Adriana F. Lubambo, Neoli Lucyszyn, Cesar L. Petzhold, Maria-R. Sierakowski, Wido H. Schreiner, Cyro K. Saul

Highlights

► We present thin film of carboxylated polystyrene nanosphere and xyloglucan layer. ► Nanospheres diameter is independent of component proportions in the mixture. ► Nanospheres diameter dependent of the angular chuck speed. ► Nanosphere diameter on silicon compared to mica is much smaller. ► Behavior similar to spin-coated colloidal dispersions.

Viscoelastic properties of fibrinogen adsorbed onto poly(ethylene terephthalate) surfaces by QCM-D

Original Research Article

Pages 246-255

Aleš Doliška, Volker Ribitsch, Karin Stana Kleinschek, Simona Strnad

Highlights

► The fibrinogen was adsorbed onto PET surfaces, modified with anticoagulants. ► A QCM-D was used for monitoring the adsorption of fibrinogen. ► Decrease of fibrinogen adsorption correlated with thickness of anticoagulant. ► Voight model was found as most appropriate for evaluation of adsorbed fibrinogen.

Chitosan–hydroxyapatite composites

Pages 256-262

Luciano Pighinelli, Magdalena Kucharska

Highlights

► Renewable and biodegradable source for medical application. ► Properties of chitosan and calcium phosphate as a biomaterial. ► Application of the composites chitosan/HAp for hard tissue regeneration. ► Chitosan–calcium phosphates composites have biochemical significance for hard tissue regeneration.

Evidence-based benefits of specific mixtures of non-digestible oligosaccharides on the immune system

Original Research Article

Pages 263-265

Alma J. Nauta, Johan Garssen

Highlights

► Non-digestible carbohydrates are recognized as key immunomodulating molecules. ► Non-digestible carbohydrates effect mucosal and systemic immunity. ► Human milk is a major

source of non-digestible oligosaccharides. ► Alternative source of oligosaccharides have been identified. ► Immune effects have been proven in clinical setting for specific oligosaccharide mixtures.

Rheological characterization of O/W emulsions incorporated with neutral and charged polysaccharides

Original Research Article

Pages 266-272

Ricardo Padilha Vianna-Filho, Carmen Lúcia Oliveira Petkowicz, Joana Léa Meira Silveira

Highlights

► The effects of galactomannans and xyloglucan from Brazilian species, on the rheological behavior of emulsions were evaluated. ► The addition of polysaccharides increased the viscoelastic properties of the emulsions. ► The galactomannans led to better stability of the emulsions relative to charged polymers.

Hyaluronic acid lipoate: Synthesis and physicochemical properties

Original Research Article

Pages 273-278

Fabrizio Picotti, Matteo Fabbian, Rita Gianni, Alessandra Sechi, Luca Stucchi, Marco Bosco

Highlights

► Hyaluronic acid derivatives were prepared using lipoic acid and carbonyldiimidazole. ► Hyaluronic acid lipoate exhibits radical scavenger properties. ► Hyaluronic acid lipoate shows resistance to enzymatic digestion.

Curcumin/xanthan–galactomannan hydrogels: Rheological analysis and biocompatibility

Original Research Article

Pages 279-284

Eneida Janiscki Da-Lozzo, Ricardo Cambaúva Andrukaisti Moledo, Cloris Ditzel Faraco, Claudia Feijó Ortolani-Machado, Tania Mari Bellé Bresolin, Joana Léa Meira Silveira

Highlights

- ▶ A xanthan–galactomannan hydrogel was tested as a potential matrix for curcumin delivery. ▶ Curcumin did not alter the viscoelastic characteristics of the hydrogel. ▶ The curcumin/hydrogel system exhibited biocompatibility in chick embryo chorioallantoic membrane assays.

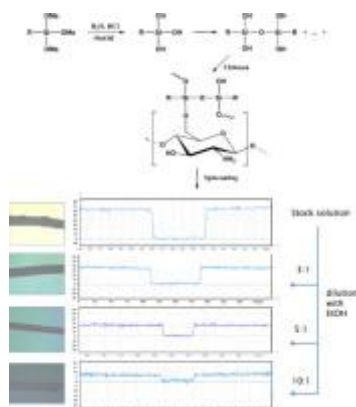
Chitosan–silane sol–gel hybrid thin films with controllable layer thickness and morphology

Original Research Article

Pages 285-290

Stefan Spirk, Gerald Findenig, Ales Doliska, Victoria E. Reichel, Nicole L. Swanson, Rupert Kargl, Volker Ribitsch, Karin Stana-Kleinschek

Graphical abstract



Highlights

- ▶ Chitosan silane hybrid thin films via combination of sol–gel process and spin coating. ▶ Layer thickness can be tuned from 5 to 70 nm. ▶ Surface morphology is not dependent on thickness of the films. ▶ Surface wettability can be tuned by using the appropriate silane precursor.

Section 8: Polysaccharides for materials and processing additives

Physicochemical design of the morphology and ultrastructure of cellulose beads

Original Research Article

Pages 291-299

Jani Trygg, Pedro Fardim, Martin Gericke, Ermei Mäkilä, Jarno Salonen

Highlights

► Beads were prepared from environmental friendly solvent into various coagulation baths. ► Morphology and ultrastructure of the cellulose beads were characterized. ► Changing the preparation parameters it was possible to control the properties.

Preparation, processing and properties of lignosulfonate–flax composite boards

Original Research Article
Pages 300-306
Edwige Privas, Patrick Navard

Highlights

► Lignosulfonate can be used to prepare fibreboard composites. ► Ethanol treatment could remove wax from surface of fibres, increasing interactions between lignosulfonate and fibres. ► Pectin acts as an interfacial adhesion promoter.

Effect of cellulose reinforcement on the properties of organic acid modified starch microparticles/plasticized starch bio-composite films

Original Research Article
Pages 307-315
Carmen-Alice Teacă, Ruxanda Bodîrlău, Iuliana Spiridon

Highlights

► Corn starch was reacted with tartaric acid and incorporated within a glycerol plasticized starch matrix. ► Bleached birch cellulose was used for obtainment of modified corn starch/plasticized starch based bio-composite films. ► Addition of birch cellulose determined a slightly improvement of the starch-based films water resistance. ► Significant interactions between cellulose fibers and starch by restricting the chain motion of starch matrix were evidenced. ► Thermal analysis indicated an improvement to some degree of starch-based films stability by addition of birch cellulose.

Ion-interactions as driving force in polysaccharide assembly

Original Research Article
Pages 316-323
Thomas Bechtold, Avinash P. Manian, Hale B. Öztürk, Uttam Paul, Barbora Šíroká, Ján Šíroký, Hossam Soliman, Loan T.T. Vo, Hai Vu-Manh

Highlights

► Ionic components can take a particular role in polysaccharide structuring. ► Ionic interactions include ion exchange, charge neutralisation, complex formation. ► Polysaccharide interaction can be strengthened in presence of multi-valent ions. ► Ionic interactions impair polysaccharide dis-assembly and re-assembly.

Cyclodextrin-grafted cellulose: Physico-chemical characterization

Original Research Article

Pages 324-330

B. Medronho, R. Andrade, V. Vivod, A. Ostlund, M.G. Miguel, B. Lindman, B. Voncina, A.J.M. Valente

Highlights

► Modification of cellulose with cyclodextrins. ► Physico-chemical characterization by means of FTIR, CP-MAS NMR and TGA. ► Cyclodextrins chemically attached (esterification) to the cellulose. ► CD-grafted cellulose forms a strong tridimensional network and becomes less soluble in water based solvents.

Nanoincorporation of layered double hydroxides into a miscible blend system of cellulose acetate with poly(acryloyl morpholine)

Original Research Article

Pages 331-338

Sachi Yoshitake, Tetsuya Suzuki, Yoshiharu Miyashita, Dan Aoki, Yoshikuni Teramoto, Yoshiyuki Nishio

Highlights

► A poly(acryloyl morpholine)/cellulose acetate (PACMO/CA) pair forms miscible blends. ► A layered double hydroxide (LDH) was prepared and modified with different ionic oligomers. ► The resulting organophilic LDHs were incorporated as nano-filler into miscible PACMO/CA matrices. ► The extent of improvement in the thermo-mechanical property of the blends was examined. ► 12-Hydroxystearic acid-modified LDH exercised an especially high reinforcement effect.

Functional properties of chitosan-based films

Original Research Article

Pages 339-346

I. Leceta, P. Guerrero, K. de la Caba

Highlights

► Flexible and transparent chitosan-based films. ► Improvement of mechanical properties by chitosan–glycerol interactions. ► Maintenance of good optical and barrier properties for food packaging applications.

Section 9: Polysaccharides for biofuels and high value chemicals

Effect of acid concentration and pulp properties on hydrolysis reactions of mercerized sisal

Original Research Article

Pages 347-356

Talita M. Lacerda, Márcia D. Zambon, Elisabete Frollini

Highlights

► Hydrolysis-sisal pulp: influence of acid concentration, fibers size, crystallinity. ► Goal: search for good results for both non-hydrolyzed material and liquor quality. ► Analysis: liquor composition, non-hydrolyzed cellulose (application as materials). ► Same amount of glucose was obtained using lower acid concentration (compared to 30%). ► Fibers with different lengths and crystallinity: crystallinity was more important.

Nanocrystalline cellulose extraction process and utilization of the byproduct for biofuels production

Original Research Article

Pages 357-363

Sanaa Pirani, Raed Hashaikeh