

# Carbohydrate Polymers

Volume 91, Issue 2, Pages 477-718 (16 January 2013)

## **A comparative study on the chitosan membranes prepared from glycine hydrochloride and acetic acid**

Original Research Article

*Pages 477-482*

Bomou Ma, Xiang Li, Aiwen Qin, Chunju He

### **Highlights**

► Gly·HCl is a promising solvent to prepare regenerated chitosan membrane (CSM). ► The prepared CSM presents a novel structure and superior mechanical performance. ► The chitosan microporous membranes (CSMMs) were prepared using PEG as porogen. ► The morphology of CSMMs prepared from Gly·HCl and acetic acid is different.

## **Selective sulfation of carrageenans and the influence of sulfate regiochemistry on anticoagulant properties**

Original Research Article

*Pages 483-491*

Cristiano A. de Araújo, Miguel D. Nosedá, Thales R. Cipriani, Alan G. Gonçalves, Maria Eugênia R. Duarte, Diogo R.B. Ducatti

### **Highlights**

► Carrageenans were selectively sulfated to produce rare diads. ► The new diads synthesized were characterized by 1D and 2D NMR. ► Sulfated derivatives showed higher anticoagulant activities than native carrageenans. ► Sulfation at C2 of anhydro units and C6 of  $\beta$ -d-Galp improved anticoagulant activity.

## **Acrylic acid grafted guar gum–nanosilica membranes for transdermal diclofenac delivery**

Original Research Article

*Pages 492-501*

Arindam Giri, Tridib Bhunia, Samir Ranjan Mishra, Luna Goswami, Asit Baran Panda, Sagar Pal, Abhijit Bandyopadhyay

### **Highlights**

► Guargum based hydrophobic bionanocomposites for transdermal diclofenac delivery. ► Acrylic acid grafting in presence of nanosilica generates cage morphology. ► The cage density maximizes at 1 wt% nanosilica content. ► Corresponding bionanocomposite shows slowest drug release for high encapsulation.

## **Comparison study of TEMPO and phthalimide-*N*-oxyl (PINO) radicals on oxidation efficiency toward cellulose**

Original Research Article

*Pages 502-507*

Gabriela Biliuta, Lidija Fras, Mioara Drobota, Zdenka Persin, Tatjana Kreze, Karin Stana-Kleinschek, Volker Ribitsch, Valeria Harabagiu, Sergiu Coseri

### **Highlights**

► The oxidation efficiency comparison between TEMPO and *N*-hydroxyphthalimide (NHPI) of viscose was studied. ► The amount of carboxylic groups formed is higher when NHPI was used as mediator. ► The best preservation of the fibers's morphology was observed when NHPI acts as mediator. ► TEMPO oxidation of viscose provides lower amount of carboxylic groups as compared with NHPI. ► TEMPO mediated oxidation of viscose leads to a higher depolymerization as compared with NHPI.

## **Effects of molecular weight and pyridinium moiety on water-soluble chitosan derivatives for mediated gene delivery**

Original Research Article

*Pages 508-517*

Warayuth Sajomsang, Pattarapond Gonil, Uracha Rungsardthong Ruktanonchai, Maleenart Petchsangai, Praneet Opanasopit, Satit Puttipipatkachorn

### **Highlights**

► Chitosan containing pyridinium moiety was synthesized as a model DNA vector. ► Nanopolyplex based on chitosan derivative ionically bonded to DNA was obtained. ► Transfection efficiency depended on MW, quaternary ammonium type and N/P ratio. ► Enhancement in transfection efficiency and reduction of cytotoxicity was achieved.

## **Green synthesis of gold nanoparticles using a glucan of an edible mushroom and study of catalytic activity**

Original Research Article

*Pages 518-528*

Ipsita K. Sen, Kousik Maity, Syed S. Islam

## Highlights

► Gold nanoparticles (Au NPs) were synthesized using a glucan isolated from an edible mushroom. ► Glucan acts as both reducing and stabilizing agent. ► Au NPs were characterized by UV–visible, HR-TEM, XRD, FE-SEM and FT-IR analysis. ► Au NPs–glucan bioconjugates functioned as catalyst in the reduction of 4-NP. ► The effect of gold loading and particle size on reduction rate of 4-NP was studied.

## Effect of PEG–salt mixture on the gelation temperature and morphology of MC gel for sustained delivery of drug

Original Research Article

*Pages 529-536*

Mrinal Kanti Bain, Dipanwita Maity, Biplab Bhowmick, Dibyendu Mondal, Md. Masud Rahaman Mollick, Gunjan Sarkar, Manas Bhowmik, Dipak Rana, Dipankar Chattopadhyay

## Highlights

► Two salt out salts (NaT and NaC) were added to the MC–PEG solution to reduce the gelation temperature close to physiological temperature. ► UV–vis spectroscopy, viscometry and rheometry were used to measure the gelation temperature of all solutions. ► The surface topography and cross-sectional structure of the freeze-dried samples of hydrogels were examined. ► In vitro drug release studies showed that drug release time increased from 6 to 9 h by only changing the salt from NaT to NaC. ► Release of the drug is correlated with the gel morphology.

## Development and evaluation of tamarind seed xyloglucan-based mucoadhesive buccal films of rizatriptan benzoate

Original Research Article

*Pages 537-542*

Amelia M. Avachat, Kishore N. Gujar, Kishor V. Wagh

## Highlights

► Buccal films were developed using tamarind seed xyloglucan as novel polysaccharide polymer. ► Bilayer films were prepared by  $3^2$  factorial design for buccal delivery of rizatriptan benzoate. ► Tamarind seed xyloglucan could be a promising vehicle for the buccal drug delivery system.

## Thermal expansion behavior of hydrate paramylon in the low-

## **temperature region**

Original Research Article

*Pages 543-548*

Kayoko Kobayashi, Satoshi Kimura, Eiji Togawa, Masahisa Wada

### **Highlights**

► We have investigated the thermal expansion behavior of hydrate paramylon. ► There is a new hydrate paramylon phase in the low-temperature region. ► The phase transition occurred reversibly around 270 K. ► The unit cell parameters and molecular conformation changed with the transition. ► We report the thermal expansion coefficients of the new hydrate paramylon phase.

## **TiO<sub>2</sub> nanowire and TiO<sub>2</sub> nanowire doped Ag-PVP nanocomposite for antimicrobial and self-cleaning cotton textile**

Original Research Article

*Pages 549-559*

A.A. Hebeish, M.M. Abdelhady, A.M. Youssef

### **Highlights**

► We prepared TiO<sub>2</sub> nanowire and TiO<sub>2</sub> doped with Ag-NP and evaluated by XRD, SEM and TEM. ► Cotton fabric and PVP treated cotton fabric were coated with the prepared nanomaterials. ► Photocatalytic activity of coated cotton fabric with TiO<sub>2</sub> nanomaterials was studied. ► Mechanical properties of treated cotton fabric were evaluated. ► We conclude that the treated cotton fabrics have good antibacterial activity.

## **Hydrophilic modification of polyester fabric by applying nanocrystalline cellulose containing surface finish**

Original Research Article

*Pages 560-567*

Masuduz Zaman, Hongbin Liu, Huning Xiao, Felipe Chibante, Yonghao Ni

### **Highlights**

► Quaternary ammonium chloride modification of nanocrystalline cellulose. ► Nanocrystalline cellulose incorporated textile surface finishing system. ► Hydrophilic modification of polyester fabric by applying nanocrystalline cellulose containing surface finish. ► Enhanced hydrophilicity and retention of cationic nanocrystalline cellulose.

## **Mucoadhesive properties of tamarind-seed polysaccharide/hyaluronic acid mixtures: A nuclear magnetic resonance spectroscopy investigation**

Original Research Article

*Pages 568-572*

Gloria Uccello-Barretta, Federica Balzano, Letizia Vanni, Marco Sansò

### **Highlights**

▶ A non-covalent aggregate hyaluronic acid/tamarind-seed polysaccharide is formed. ▶ A minimum polysaccharide concentration was needed to obtain stable aggregates. ▶ The polysaccharides mixture has high affinity for mucin. ▶ NMR measurements proved stability and affinity for mucin of polysaccharides mixture.

## **Competitive adsorption between sugar beet pectin (SBP) and hydroxypropyl methylcellulose (HPMC) at the oil/water interface**

Original Research Article

*Pages 573-580*

Xiangyang Li, Saphwan Al-Assaf, Yapeng Fang, Glyn O. Phillips

### **Highlights**

▶ Competitive adsorption between two polysaccharide emulsifiers is investigated for the first time. ▶ The mechanism of emulsification for both emulsifiers is further clarified. ▶ HPMC dominates the emulsion properties when present at >0.2 wt.%. ▶ The main role of SBP is to reduce the number of large droplets.

## **Preparation of starch–sodium lignosulfonate graft copolymers via laccase catalysis and characterization of antioxidant activity**

*Pages 581-585*

Randal L. Shogren, Atanu Biswas

### **Highlights**

▶ Graft copolymers of starch and sodium lignosulfonate (SLS). ▶ Laccase catalysis in aqueous solution. ▶ Starch–SLS graft copolymers were effective antioxidants. ▶ New simple method for preparing starch chemically modified with phenolic compounds. ▶ Resulting antioxidant polymers have potential in food, cosmetic and packaging applications.

## **Identification and releasing characteristics of high-amylose corn starch–**

## **cinnamaldehyde inclusion complex prepared using ultrasound treatment**

*Pages 586-589*

Yaoqi Tian, Yanqiao Zhu, Mohanad Bashari, Xiuting Hu, Xueming Xu, Zhengyu Jin

### **Highlights**

► Cinnamaldehyde was encapsulated by corn starch to form an inclusion complex. ► The formation of the inclusion complex was confirmed by FT-IR and TGA. ► Ultrasound treatment could generate higher encapsulation rate. ► The inclusion complex had good retention ability of cinnamaldehyde.

## **Structural and mechanical characteristics of film using modified corn starch by the same two chemical processes used in different sequences**

Original Research Article

*Pages 590-596*

Liping Qiu, Fei Hu, Yali Peng

### **Highlights**

► Cross-linking and esterification were conducted to get complexly modified corn starches in different sequences. ► Films were made from dual modified starches. ► Fourier transform infrared spectroscopy, X-ray diffraction and scanning electron microscopy of modified starch and films were investigated. ► Mechanical characteristics of films were investigated, tensile strength and transperance of modified starch films were higher.

## **Characterization of the interaction between chitosan and inorganic sodium phosphates by means of rheological and optical microscopy studies**

Original Research Article

*Pages 597-602*

Luca Casettari, Marco Cespi, Giovanni Filippo Palmieri, Giulia Bonacucina

### **Highlights**

► Determination of rheological properties of chitosan/inorganic phosphate thermogel. ► Influence of chitosan/inorganic phosphate ratio, pH and storage stability. ► Phosphate/chitosan system at ratio 2 showed pseudo thermogelling capacity at pH 7.

## **Chemical characterization of a water insoluble (1 → 3)- $\alpha$ -D-glucan from**

## **an alkaline extract of *Aspergillus wentii***

Original Research Article

Pages 603-608

Adam Choma, Adrian Wiater, Iwona Komaniecka, Roman Paduch, Małgorzata Pleszczyńska, Janusz Szczodrak

### **Highlights**

► A water-insoluble glucan (AW-WIG) was isolated from *Aspergillus wentii*. ► The molecular weight of the polymer was estimated as about 850 kDa. ► AW-WIG is a linear polymer almost exclusively composed of (1 → 3)-linked  $\alpha$ -d-glucose. ► The polymer was divided into subunits separated by spacers of (1 → 4)-linked glucoses. ► AW-WIG may be used as an inducer in mutanase production.

## **Preparation and slowly digestible properties of $\beta$ -cyclodextrins ( $\beta$ -CDs)-modified starches**

Original Research Article

Pages 609-612

Jinling Zhan, Yaoqi Tian, Qunyi Tong

### **Highlights**

►  $\beta$ -CDs significantly increased the yield of slowly digestible starch (SDS). ► The optimum conditions for preparation of  $\beta$ -CDs-modified starches were obtained. ►  $\beta$ -CDs-modified starches showed intermediate predicted glycemic indexes (pGI). ►  $\beta$ -CDs-induced modification was one of promising techniques for preparing SDS.

## **Development of antimicrobial cotton fabrics using herb loaded nanoparticles**

Original Research Article

Pages 613-617

R. Rajendran, R. Radhai, T.M. Kotresh, Emilia Csiszar

### **Highlights**

► Chitosan-alginate nanoparticles were loaded with leaf extract of *O. sanctum*. ► The herbs loaded nanoparticles had an average particle size of 35 nm. ► The treated fabrics showed enhanced antibacterial activity and wash durability.

## **Thiolated xyloglucan: Synthesis, characterization and evaluation as**

## **mucoadhesive *in situ* gelling agent**

Original Research Article

Pages 618-625

Hitendra S. Mahajan, Vinod Kumar Tyagi, Ravindra R. Patil, Sanket B. Dusunge

### **Highlights**

► Xyloglucan is a natural polysaccharide suitable for mucosal delivery. ► Thiolation of xyloglucan to enhance bioadhesive property of xyloglucan. ► Characterization of thiolated xyloglucan as mucoadhesive gelling agent. ► Thiolated xyloglucan undergoes rapid *in vitro* and *in vivo* degradation. ► Thiolated xyloglucan is found to be safe to mucosa.

## **Quantitation of 4-*O*-methylglucuronic acid from plant cell walls**

Pages 626-630

Sun-Li Chong, Sanna Koutaniemi, Liisa Virkki, Henna Pynnönen, Päivi Tuomainen, Maija Tenkanen

### **Highlights**

► The 4-*O*-methyl- $\alpha$ -d-glucopyranosyl uronic acid (meGlcA) was purified from commercial birch xylan. ► meGlcA content was underestimated if glucopyranosyl uronic acid (GlcA) was used as calibration standard in GC or HPAEC-PAD. ► A method for better estimation of meGlcA content derived from acid methanolysis and GC analysis is suggested.

## **Preparation of amino terminated polyamidoamine functionalized chitosan beads and its Cr(VI) uptake studies**

Original Research Article

Pages 631-637

Muniyappan Rajiv Gandhi, Sankaran Meenakshi

### **Highlights**

► Zr<sup>4+</sup> loaded polyamidoamine chitosan beads used to remove Cr(VI) for first time. ► Maximum sorption capacity with the minimum 2 h contact time. ► The Cr(VI) removal is via adsorption/electrostatic attraction. ► Polyamidoamine chitosan beads is a promising sorbent for enhanced removal of Cr(VI).

## **Improving the mechanical and thermal properties of gelatin hydrogels**



## **cross-linked by cellulose nanowhiskers**

Original Research Article

*Pages 638-645*

Rajalaxmi Dash, Marcus Foston, Arthur J. Ragauskas

### **Highlights**

- ▶ Oxidized cellulose nanowhiskers as biorenewable and biocompatible chemical cross-linkers.
- ▶ Chemical cross-linking between gelatin and oxidized nanowhiskers improved the storage modulus by 150%.
- ▶ A significant increase in thermal stability of the hydrogels after chemical cross-linking.

## **Evaluation of pretreatment methods for enzymatic saccharification of wheat straw for bioethanol production**

Original Research Article

*Pages 646-650*

Sai Prashanthi Govumoni, Sravanthi Koti, Srilekha Yadav Kothagouni, Venkateshwar S, Venkateswar Rao Linga

### **Highlights**

- ▶ Wheat straw, abundant lignocellulosic feed stock selected for producing ethanol.
- ▶ Pretreatment with alkali followed by acid and vice versa for enzyme hydrolysis.
- ▶ Pretreatment at low temperature is economically feasible.
- ▶ Recovery of maximum sugars by enzymatic hydrolysis for high ethanol yield.

## **Chitosan/alginate complexes for vaginal delivery of chlorhexidine digluconate**

Original Research Article

*Pages 651-658*

A. Abruzzo, F. Bigucci, T. Cerchiara, B. Saladini, M.C. Gallucci, F. Cruciani, B. Vitali, B. Luppi

### **Highlights**

- ▶ Chitosan/alginate complex as a new vaginal delivery system.
- ▶ Vaginal inserts against vaginal infections.
- ▶ Antimicrobial activity of vaginal inserts loaded with chlorhexidine digluconate.

## **Beetle forewings: Epitome of the optimal design for lightweight composite materials**

Review Article

Pages 659-665

Jinxiang Chen, Gang Wu

### **Highlights**

► The optimal design in the forewings of two beetles species is reported. ► Extensive review of the work related to the structure of the beetle forewing is presented. ► A sandwich structure based on beetle forewing configuration is proposed. ► A new design route to develop biomimetic composite materials is presented.

## **Extruded films of blended chitosan, low density polyethylene and ethylene acrylic acid**

Original Research Article

Pages 666-674

A.P. Martínez-Camacho, M.O. Cortez-Rocha, A.Z. Graciano-Verdugo, F. Rodríguez-Félix, M.M. Castillo-Ortega, A. Burgos-Hernández, J.M. Ezquerro-Brauer, M. Plascencia-Jatomea

### **Highlights**

► Chitosan–LDPE extruded films were obtained using ethylene-acrylic acid copolymer. ► Ethylene-acrylic acid copolymer ensures adhesion in the interphase of both polymers. ► Chitosan forms conglomerates, affecting the mechanical properties of the films. ► Chitosan–LDPE extruded films inhibited the radial growth of *Aspergillus niger*. ► Morphological changes and increased diameter of fungi hyphae were induced.

## **Inducing surface hydrophobization on cornstarch film by SF<sub>6</sub> and HMDSO plasma treatment**

Original Research Article

Pages 675-681

Daniele C. Bastos, Anastácia E.F. Santos, Marta D. da Fonseca, Renata A. Simão

### **Highlights**

► Plasma deposited films form a hydrophobic and soft coating. ► SF<sub>6</sub> treatment induces an increase in roughness in both starch and HMDSO films. ► SF<sub>6</sub> reticulation on starch was proved

by elastic modulus increase. ► Plasma treatment can induce starch hydrophobization. ► The most hydrophobic film (SF<sub>6</sub>/HMDSO) showed an increase of the O/C and O/Si ratios.

## **Novel biopolymer gel electrolyte for dye-sensitized solar cell application**

Original Research Article

*Pages 682-685*

Rahul Singh, Nitin A. Jadhav, S. Majumder, B. Bhattacharya, Pramod K. Singh

### **Highlights**

► Biodegradable newly developed electrolyte (first time reported system). ► Detail characterization & explanation. ► Successful device application (in DSSC).

## **Microwave based synthesis of polymethyl methacrylate grafted sodium alginate: its application as flocculant**

Original Research Article

*Pages 686-692*

Priti Rani, Sumit Mishra, Gautam Sen

### **Highlights**

► Polymethyl methacrylate grafted sodium alginate was synthesized by *microwave assisted* method. ► Higher the percentage grafting of the graft co polymer, higher is its intrinsic viscosity. ► The graft copolymer proved superior flocculant than sodium alginate in coal fine suspension. ► The optimized flocculant dosage as found in coal fine suspension was 0.375 ppm.

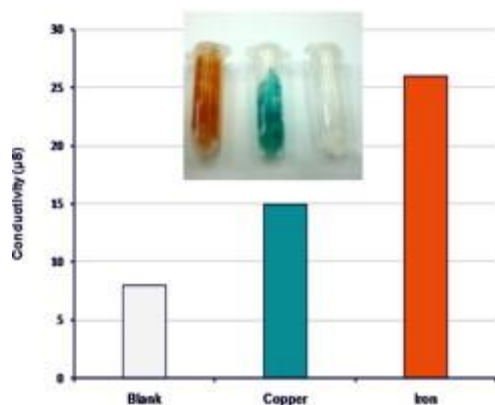
## **An innovative method for preparation of nanometal hydroxide superabsorbent hydrogel**

Original Research Article

*Pages 693-698*

Enas M. Ahmed, Fatma S. Aggor, Ahmed M. Awad, Ahmed T. El-Aref

### **Graphical abstract**



### Highlights

- ▶ A novel preparation of conducting nanometal hydroxide hydrogel is undertaken. ▶ A superabsorbent hydrogel was prepared through polymerization of acrylic acid/acrylate. ▶ Electro-deposition of nanometal hydroxides of copper and iron in hydrogel network has been developed. ▶ Swelling characteristics and kinetics in different media has been investigated. ▶ Conductivity measurements indicated an improvement in conductance of the resulting hydrogel.

### Sugar palm (*Arenga pinnata*): Its fibres, polymers and composites

Review Article

Pages 699-710

M.R. Ishak, S.M. Sapuan, Z. Leman, M.Z.A. Rahman, U.M.K. Anwar, J.P. Siregar

### Highlights

- ▶ We discuss recent advances in the research of sugar palm (*Arenga pinnata*). ▶ We focus on properties of fibres, polymers and composites derived from sugar palm. ▶ We also focus on efforts on enhancing the properties of composites.

### Thermal and mechanical properties of bio-nanocomposites reinforced by *Luffa cylindrica* cellulose nanocrystals

Original Research Article

Pages 711-717

Gilberto Siqueira, Julien Bras, Nadège Follain, Sabrina Belbekhouche, Stéphane Marais, Alain Dufresne

### Highlights

- ▶ *Luffa cylindrica* CNC reinforced PCL were prepared. ▶ Fully biodegradable high-performance nanocomposites were obtained. ▶ Detailed investigation of thermal and

mechanical properties. ► Positive effect of the chemical surface modification of the nanoparticles. ► Chemical modification promotes the interfacial crystallization.

## **Editorial Board**

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