8th World Congress on

Biopolymers & Bioplastics

June 28-29, 2018 | Berlin, Germany

Scientific Tracks & Abstracts

Day 1

Biopolymer Congress 2018

Blaženka kos et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

S-layer proteins and bacteriocins in probiotics as living drugs – impact on microbiota

Blaženka kos, Katarina zorić, martina banić, andreja leboš pavunc, ksenija uroić, jasna novak and **jagoda šušković**
University of Zagreb, Croatia

A rich collection of autochthonous lactic acid bacteria (LAB) was screened for the presence of S-layer proteins and production of bacteriocins. Analyses of bacterial surface proteins using SDS-PAGE, 2D-PAGE and PCR with specific primers for slp genes, discovered that only four *Lactobacillus brevis* strains express S-layer proteins, while using antibacterial activity assays and PCR with specific primers for genes encoding various bacteriocins, only three *Lactobacillus plantarum* strains were confirmed as bacteriocin producers. Biological functions of *Lactobacillus* S-layer proteins are still poorly understood, however, our investigations confirmed that they mediate bacterial adherence to intestinal epithelial cells and extracellular matrix proteins and also influence the immune response, which are important probiotic properties. When applied as mixed culture, S-layer protein carrying strain and bacteriocin producing strain made strong influence on microbiota composition of rats used as animal models in investigation of Alzheimer's disease. Purified S-layer proteins of *L. brevis* SF9B strain, with MW of 50.9 kDa and pI of 9.54, were identified using LC/MS method, while the prediction of their secondary structure was generated using I-TASSER modelling. The fact that purified S-layers are stable toward non-physiological pH and that they protect the cell against various stress conditions, opens an interesting perspective in the development of vehicles for oral administration of drugs or vaccines, specially taking into account GRAS (Generally Regarded as Safe) status of LAB.

Recent Publications

1. Šeme H., Bogovič Matijašić B., Švigelj, K., Langerholc, T., Fujs S., Horvat, J., Zlatić, E., Gjuračić K., Petković H., Štempelj M., Kos B., Šušković J., Kosec G. (2017) Generation of *Lactobacillus plantarum* strains with improved potential to target gastrointestinal disorders related to sugar malabsorption, *Food Research International* 94: 45-53.
2. Hana Šuranská, Peter Raspor, Ksenija Uroić, Nataša Golić, Blaženka Kos, Sanja Mihajlović, Jelena Begović, Jagoda Šušković, Ljubiša Topisirović, Neža Čadež (2016) Characterisation of the yeast and mould biota in traditional white pickled cheeses by culture-dependent and independent molecular techniques, *Folia Microbiol.* 61:455–463.
3. Uroić, K., Beganović, J., Hynönen, U., Pietilä, T. E., Leboš Pavunc, A., Kant, R., Kos, B., Palva, A., Šušković, J. (2016) The role of S-layer in adhesive and immunological properties of probiotic starter culture *Lactobacillus brevis* D6 isolated from artisanal smoked fresh cheese. LWT - Food *Sci. Technol.* 69: 623-632.
4. M. Gačić, N. Bilandžić, Đ. Ivanec Šipušić, M. Petrović, B. Kos, N. Vahčić, J. Šušković (2015) Degradation of Oxytetracycline, Streptomycin, Sulphathiazole and Chloramphenicol Residues in Different Types of Honey, *Food Technol. Biotechnol. 53* (2) 154–162.
5. M. Zivkovic, N. Cadez, K. Uroic, M. Miljkovic, M. Tolinacki, P. Dousova, B. Kos, J. Suskovic, P. Raspor, Lj. Topisirovic, N. Golic (2015) Evaluation of probiotic potential of yeasts isolated from traditional cheeses manufactured in Serbia and Croatia,

Biography

Blaženka Kos has years of experience in research, evaluation and teaching in the field of biotechnological production of enzymes, antibiotics, probiotics and starter cultures at the Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia. Her scientific work covers different fields of biotechnology, especially industrial microbiology. The main area of her research is production and application of probiotics as living drugs and selection of strains within the probiotic concept. Microencapsulation technologies, as a useful tool to improve the delivery of probiotics and functional starter cultures, are of her special scientific interest.

bkos@pbf.hr

Maiko K. Okajima et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Super-anisotropic hydrogels of cyanobacterial megamolecules

Maiko K. Okajima*, **Saranyoo Sornkamnerd**, **Kittima Amornwachirabodee** and **Tatsuo Kaneko***
Japan Advanced Institute of Science and Technology, Japan

Hydrogels are composed of three-dimensional network structures of synthetic and/or natural polymers which are able to absorb and to retain significant amount of water. The hydrogels have been extensively used in various biomedical applications such as drug delivery, cell carriers and/or entrapment, wound management, and tissue engineering. Sacran which is extracted from Aphanothece sacrum biomaterials is a cyanobacterial polysaccharide with a very high molecular weight of 29 Mg/mol, containing 11 % of sulfate group, 22 % of carboxyl group. Sacran has a function of liquid crystals in thin aqueous solution and a super-absorbent property to induce an anti-inflammatory activity2. Here we found that the physical hydrogel of sacran can be prepared from the film made by water-casting. Practically sacran solution with a concentration of 0.5 % was dried at 60 degC for 12 h to create the thin film with in-plane orientation, and the film was immersed into pure water to form anisotropic hydrogels having a layer structure. This phenomenon was observed only in high-molecular weight sacran but not in other polysaccharides. Furthermore, it was found that the swollen degree of the gels was controlled by the preheating temperature ranging 70-140 degC, to adjust the swollen degree of the hydrogels from 10 to 400 times. The following properties of the hydrogels were further evaluated, water content, swelling ratio in water, gel strength, and stimuli responsiveness, in terms of anisotropy. The mechanical properties and network structures of hydrogels were also studied, clarifying that porous hydrogels, even those with a high quantity of pores were tough owing to the pores orienting along the layer direction like tunnels. The authors gratefully acknowledges Grant-in-Aid supports from A-step, (AS2915173U) of JST, Japan and from collaborative research fund of GSM, Japan. grant-in-aid for Challenging Exploratory Research of MEXT (16K14077).

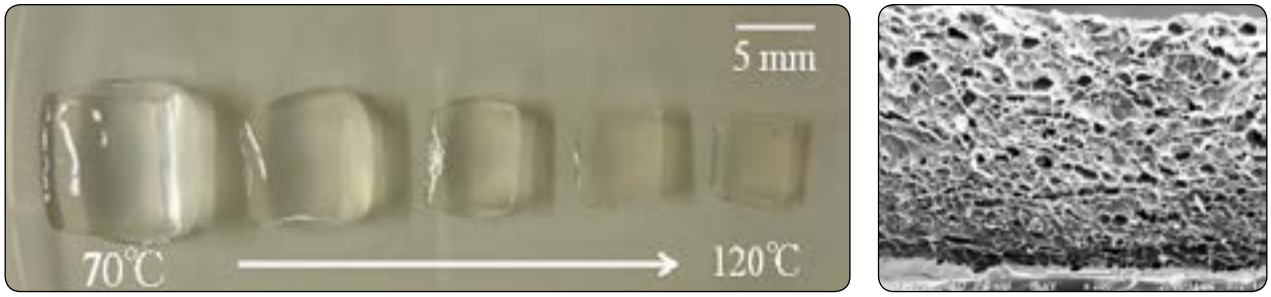


Figure. Hydrogels prepared by in-situ gelation of films thermally-cross-linked through annealing at various temperatures (left). SEM of side view of freeze-dried gel films (right)

Recent Publications

1. Amornwachirabodee K, Okajima KM, Kaneko T (2015) Uniaxial Swelling in LC Hydrogels Formed by Two-step Cross-linking, Macromolecules, 48: 8615–8621.
2. Okajima KM, Mishima R, Amornwachirabodee K, Okeyoshi K, Kaneko T (2015) Anisotropic Swelling in Hydrogels Formed by Cooperatively Aligned Megamolecules, RSC Adv. 5: 86723-86729.
3. Ngatu NR, Tanaka M, Okajima KM, Yokogawa M, Ikeda M, Inoue M, Watanabe H, Kanbara S, Nojima S, Kaneko T, Suganuma N (2016) Anti-allergic effects and immunomodulatory activity of sacran, a bioactive compound from river alga aphanothece sacrum, Evidence-based Med.Public Health, 2: e1438.
4. Zhao Y, Hien KTT, Mizutani G, Rutt HN, Amornwachirabodee K, Okajima KM, Kaneko T (2017) Optical Second-Harmonic Images of Sacran Megamolecules Aggregates, J. Opt. Soc. Amer. A, 34: 146-152.
5. Sornkamnerd S, Okajima KM, Matsumura K, Kaneko T (2018) Surface-selective control of cell-orientation on cyanobacterial liquid crystalline gels, ACS Omega, in press.

Biography

Maiko Kaneko Okajima is the Postdoctoral research fellow of the School of Materials Science at JAIST, Nomi, Japan, and R&D manager of Green Science Materials Inc. Japan. She has approximately 65 publications. She has been involved in scientific and industry-academic collaborative projects in the fields of Cyanobacterial biology, Polysaccharides, Biomedical design etc. Additionally she has engaged in establishment of Start-up Company on cyanobacterial polysaccharides and their applications as biomedical and cosmetic ingredients.

k-maiko@jaist.ac.jp

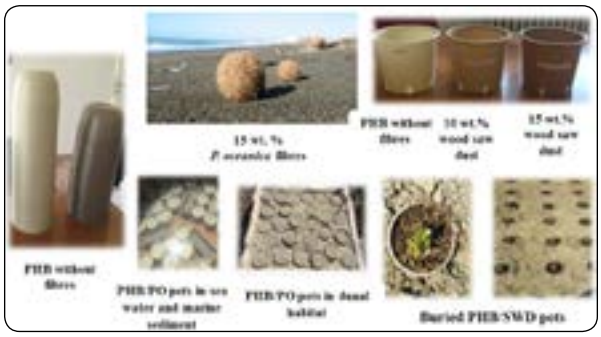
Notes:

Maurizia Seggiani et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Biocomposites based on PHBs and natural fibers for commodity applications in different environments: processing, performance in soil, compost and sea water

Maurizia Seggiani, Patrizia Cinelli, Norma Mallegni, Elena Balestri, Claudia Vannini, Flavia Vallerini, Claudio Lardicci and **Andrea Lazzeri**
University of Pisa, Italy

Composites based on poly(3-hydroxybutyrate) (PHB) and natural fibres such as fibres of *Posidonia oceanica* (PO), wood saw dust (WSD) and bran were produced by extrusion in presence of appropriate amounts of plasticizer (Acetyl Tri-n-Butyl Citrate, ATBC) and filler (calcium carbonate). Thermal, rheological, mechanical and morphological characterizations of the developed composites were conducted in order to optimize formulations in terms of processability and mechanical performance. The biodegradability of the optimized composites was investigated under controlled composting conditions in accordance with standard methods (ASTM D5338-98, ISO 20200-2004) and in soil for the PHB/WSD composites, because their expected fate is to be treated in composting plants or used for applications in agriculture; in simulated and natural marine sediments in mesocosms and dune habitat for the PHB/PO composites, because their potential applications are in marine environment, such as natural engineering interventions (restoration of seagrass habitats). The optimized PHB/WSD compounds were used for the production of pots for terrestrial plants, PHB/PO compounds for pots and other items usable in the sea and sand dunes, such as transplanting tools and structures for restoration or protection of coastal habitats, and the PHB/bran fibres for the production of food contact containers. The results showed that the industrial processing by extrusion of the composites did not show any difficulty up to 20 wt. % fibres and the presence of the fibres (PO or WSD) facilitated the disintegration of the PHB matrix and, consequently, accelerated its biodegradation both in compost, soil, sea water and dune. The PHB/WSD composites resulted no-phytotoxic by using cress (*Lepidium sativum* L.) germination test, compostable in accordance with EN 13427:2000, biodegradable in soil at controlled degradation rate. The PHB/PO composites showed a good controlled biodegradation rate in marine sediments and were suitable to manufacture items usable, for example, in natural engineering interventions and represent an interesting valorisation of the PO fibrous wastes accumulated in large amounts on coastal beaches.



Recent Publications

1. Seggiani M, Cinelli P, Balestri E, Mallegni N, Stefanelli E, Rossi A, Lardicci C, Lazzeri A (2018) Novel sustainable composites based on Poly(hydroxybutyrate-co-hydroxyvalerate) and seagrass beach-cast fibers: performance and degradability in marine environments. Submitted to Materials and requested minor revisions.
2. Seggiani M, Altieri R, Puccini M, Stefanelli E, Esposito A, Castellani F, Stanzione V, Vitolo S (2018) Polycaprolactone-collagen Hydrolysate thermoplastic blends: processability and biodegradability/compostability. Polymer Degradation and Stability 150:13–24.
3. Seggiani M, Cinelli P, Mallegni N, Balestri E, Puccini M, Vitolo S, Lardicci C, Lazzeri A (2017) New Bio-Composites based on Polyhydroxyalkanoates and *Posidonia oceanica* fibres for applications in a marine environment. Materials 10(4): 326.

4. Seggiani M, Cinelli P, Geicu M, Popa ME, Puccini M, Lazzeri A (2016) Microbiological Valorisation of Bio-composites Based on Polylactic Acid and Wood Fibres. Chemical Engineering Transactions 49:127-132.
5. Seggiani M, Cinelli P, Verstichel S, Puccini M, Vitolo S, Anguillesi I, Lazzeri A (2015) Development of fibres-reinforced biodegradable composites. Chemical Engineering Transactions 43:1813-1818.

Biography

Maurizia Seggiani is an Associate Professor of Industrial and Technological Chemistry. Her research activities are focused on analysis/optimization of chemical processes regarding the waste management (treatment/recovery/valorisation of industrial solid/liquid/gaseous effluents), biomass gasification, green waste hydrocarbonization, and on the development and application of innovative materials such as solid adsorbents for carbon capture at high temperature and biodegradable/compostable composites for applications in agriculture and marine environments. In the last years, she has been coordinator of research projects concerning the development, processing and validation of bio-composites based on PCL and PHA and industrial byproducts (collagen hydrolysate) and natural waste fibers for different applications.

maurizia.seggiani@unipi.it

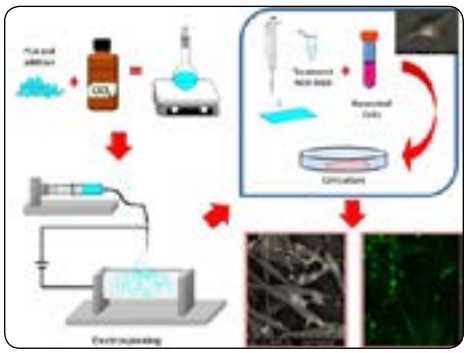
Notes:

Mariana Gutiérrez et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Generation and evaluation *in vitro* of PLA scaffolds with starch, surface modified with RGD for bone regeneration

Mariana Gutiérrez[1], **Vladimir A. Escobar**[1], **Amaury Pozos**[2] and **Diana M. Escobar**[2]
[1]IPICYT, Mexico
[2]UASLP, Mexico

Statement of the Problem: Tissue engineering is an interdisciplinary discipline that seeks to repair or replace the tissue itself. Thus, and as a first step, polymeric scaffolds with different additive (starch) content were elaborated to provide support to cells (osteoblast) and observe their capability to grow and generate new extracellular matrix. Methodology & Theoretical Orientation: In this work, films of non-woven fibers of Poly (lactic acid) (PLA) with different starch content (0, 2.5, 5.0 and 10.0% by weight) were generated by electrospinning. Subsequently, such films were surface-treated (functionalization) with arginine-glycine-aspartic acid (RGD), with the aim of increasing the adhesion and cellular affinity toward the polymeric materials. Before functionalization, the structural morphology of the support was determined according to the starch content (0, 2.5, 5.0 and 10.0% by weight), using scanning electron miscroscopy (SEM). It was observed that the conformation of the material was drastically affected with the increment of starch content. Subsequently, *in vitro* tests were performed with osteoblast cultures for 48 hours, where the biocompatibility of the materials was evaluated by LIVE / DEAD tests in which the cell viability was discriminated by simultaneous staining with calcein AM that occurs in a fluorescent green to indicate intracellular esterase activity, ie live cells. These cells were observed under a CLSM (Confocal laser scanning microscopy). On the other hand, cell proliferation was performed by MTS assays after 48 hours of incubation. While the biocompatibility of the materials was validated by the morphology of the osteoblastic cells by SEM. Conclusion and meaning: The results of the various tests indicate that the obtained scaffolds, by electrospinning of PLA with starch, can be successfully used for the regeneration of bone system cells (osteoblasts); especially when the modification of the surface is done with RGD.



Recent Publications

1. Gutiérrez-Hernández, J. M., Escobar-García, D. M., Escalante, A., Flores, H., González, F. J., Gatenholm, P., & Toriz, G. (2017). *In vitro* evaluation of osteoblastic cells on bacterial cellulose modified with multi-walled carbon nanotubes as scaffold for bone regeneration. Materials Science and Engineering: C, 75, 445-453.
2. Haddad, T., Noel, S., Liberelle, B., El Ayoubi, R., Ajji, A., & De Crescenzo, G. (2016). Fabrication and surface modification of poly lactic acid (PLA) scaffolds with epidermal growth factor for neural tissue engineering. Biomatter, 6(1), e1231276.
3. Li, X., Chang, H., Luo, H., Wang, Z., Zheng, G., Lu, X., ... & Xu, M. (2015). Poly (3-hydroxybutyrate-co-3-hydroxyhexanoate) scaffolds coated with PhaP-RGD fusion protein promotes the proliferation and chondrogenic differentiation of human umbilical cord mesenchymal stem cells *in vitro*. Journal of Biomedical Materials Research Part A, 103(3), 1169-1175.
4. Ortiz, M., Rosales-Ibáñez, R., Pozos-Guillén, A., De Bien, C., Toye, D., Flores, H., & Grandfils, C. (2017). DPSC colonization of functionalized 3D textiles. Journal of Biomedical Materials Research Part B: Applied Biomaterials, 105(4), 785-794.

5. Shao, S., Zhou, S., Li, L., Li, J., Luo, C., Wang, J., & Weng, J. (2011). Osteoblast function on electrically conductive electrospun PLA/MWCNTs nanofibers. Biomaterials, 32(11), 2821-28.

Biography

Mariana Gutiérrez got her B.S. in Chemical Engineering and her MSc. and PhD, in Polymers. She has experience in characterization and synthesis of polymers. She has interest in synthesis of new materials intended for the regeneration of tissues. Currently, she is collaborating with researchers with experience in the area of health, especially *in vitro* test in order to establish structure-characteristics-performance relationships and then to design the polymeric composites.

mariana.gutierrez@ipicyt.edu.mx

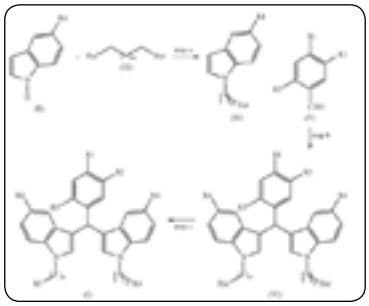
Notes:

Hikmet Nil Bayrak(Ergindemir) et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Synthesis of novel uv absorbers bisindolylmethanes and investigation of their applications on cotton-based textile materials

Hikmet Nil Bayrak(Ergindemir), Agamirze Hamitbeyli and **Nuket Ocal**
Sanko Holding ISKO Division,Turkey

Nowadays modified textiles, especially UV protective, antibacterial and antimicrobial ones have become the focus of great interest. In this study, several new UV absorbers -bis(indolyl)methane derivatives were synthesized and grafted onto polyvinyl alcohol polymer (PVA). Their application properties on cotton-based textile materials were determined; the UV protection factor values of the modified fabrics were measured (UPF); and the antibacterial features of the fabrics were tested.



Recent Publications

1. Ergindemir N, Aker A, Hamitbeyli A, Öcal N. (6 April 2017) Pub. No.: U.S. 2017/0096393 A1, Novel Bis-indolylmethanes, a Process for Their Preparation and Uses Thereof.
2. Ergindemir N, Aker A, Hamitbeyli A, Öcal N. (13 April 2017) Pub. No.: U.S 2017/0101385 A1, Novel Isoxazoles a Process for Their Preparation and Uses Thereof.
3. Ergindemir N, Aker A, Hamitbeyli A, Öcal N., (2016) '' Synthesis of Novel UV Absorbers Bisindolylmethanes and Investigation of Their Applications on Cotton-Based Textile Materials", Molecules, 2016, 21, 718.
4. Ergindemir N, Aker A, Hamitbeyli A, Öcal N., (2016) '' Synthesis of Novel Heterocyclic Imine Type UV Absorbers for Application on Cotton Based Textile Materials", Hindawi Publishing Corporation Journal of Chemistry, Volume 2016, Article ID 6387305, 6 pages.
5. Ergindemir, N., Hamitbeyli, A., Eryılmaz, J., Çobanoğlu, Ö. Akdemir, Ö. (2012) ''Nano-Structured Materials for Textile Industry", Nano 2012, XI. International Conference on Nanostructured Materials, 26-31 August 2012, Rhodes/Greece.

Biography

Hikmet Nil Bayrak has her expertise in organometallic and organic synthesis and passion in creating multifunctional textiles and improving the PPE's. Her patents on this field are granted. She is still working as research scientist in a R&D department of a textile company in Turkey, named Sanko Holding ISKO Division.

nbayrak@isko.com.tr

Andrea Anusic et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Development of novel bio-based epoxy resins: Study of the curing reaction between epoxidized plant oil and different hardeners

Andrea Anusic[1], **Katharina Resch-fauster**[2] and **Arunjunai Raj Mahendran**[3]
[1,2]Montanuniversität Leoben, Austria
[3]Wood Carinthian Competence Center, Austria

Driven by the need for replacing petroleum based materials, the development and use of thermosets based on renewable resources is growing vigorously and consistently. Thus, the overall objective of the present study was to develop a thermoset with a high bio-based carbon content. Unsaturated linseed oil was used as main material for the novel thermoset. The fatty acids of linseed oil were functionalized by the epoxidation of double bonds. In order to convert the epoxidized plant oil into a curable thermoset, non-toxic and harmless petrochemical-based hardeners and catalysts were used. The main focus was on discovering substances which enable a crosslinking reaction with the epoxidized linseed oil. The effect of different hardeners, like amines (linear and cylic), cyanamides, acids and imidazoles on the curing reaction was investigated by means of Differential Scanning Calorimetry and Infrared spectroscopy and appropriate hardener types were identified. The optimal mixing ratio was determined by systematically varying the concentrations of functionalized linseed oil and hardener. Because of the inert reactivity of the epoxidized plant oil with the hardener, also the influence of various catalysts on the curing efficiency and overall conversion rate was investigated. Promising results were achieved specifically by using dicyandiamide, which yielded a thermoset with a glass transition temperature of ~ 80 °C. The attained extensive set of information provides an explanation of the curing reaction of different hardeners with an epoxidized linseed oil. The polymer physical property profiles of the developed resins emphasize a great potential of the bio-based thermosets as substitute for petrochemical based resins. The research project is funded by the Austrian Ministry for Transport, Innovation and Technology in frame of the program "Produktion der Zukunft" under contract no. 858688, within the context of the project "Reliable and Sustainable composite production for Biobased Components". The authors acknowledge valuable scientific and technical input from bto-epoxy GmbH (Manfred Sieberer).

Biography

Andrea Anusic has her expertise on polymers which are based on renewable resources, on natural fiber reinforced composites and on the characterization of polymers. She has studied technical chemistry on the technical university in Graz (Austria). During her study she has focused on macromolecular chemistry. Now she is working on her PhD at the department of polymer engineering at the chair of Materials and Testing of Polymers. The study is about the curing of epoxidized plant oil to create novel, non-toxic and harmless resins with a high bio-based content, which can be used as substitute for petrochemical based resins.

andrea.anusic@unileoben.ac.at

Notes:

Nilay Kahya et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Preparation and physical properties of nano-cerium ion dopped carboxymethyl cellulose/alginate composite films

Nilay Kahya[1*], Ceren Topaç[1], Gülsen Akin-Evingur[2] and **F. Bedia Erim Berker[1]**
[1]Istanbul Technical University, Turkey
[2]Piri Reis University, Turkey

Carboxymethyl cellulose and alginate are non-toxic, biocompatible, and biodegradable biopolymers and are easily obtained from natural sources. In our previous study, we reported that alginate films crosslinked with cerium ions gained antimicrobial properties [1]. In addition to the antibacterial properties of cerium ions, it was reported that cerium doped composites enhanced the osteoblastic cell response [2] and cerium (III) ions increased fibroblast proliferation [3]. Cerium (III) nitrate has been successfully used in clinics for burn treatment [4]. The addition of nanoparticles to polysaccharide films increase their mechanical strength and add them different qualities. In the present study, novel cerium nanoparticles doped and cerium ion crosslinked carboxymethyl cellulose/alginate composite films were prepared as potential wound dressing materials and their physical properties were revealed by Fourier Transformed Infrared Spectroscopy (FTIR), tensile testing, swelling and light transparency experiments, and thermogravimetric analysis (TGA).

Recent Publications

1. Kaygusuz H, Torlak E, Evingür GA, von Klitzing R, Erim FB (2017) Antimicrobial cerium ion-chitosan crosslinked alginate biopolymer films: A novel and potential wound dressing. International Journal of Biological Macromolecules 105:1161-1165.
2. Morais DS, Fernandes S, Gomes PS, Sampaio P, Ferraz MP et. al (2015) Novel cerium doped glass-reinforced hydroxyapatite with antibacterial and osteoconductive properties for bone tissue regeneration. Biomedical Materials 10:055008.
3. Schmidlin PR, Tchouboukov A, Wegehaupt FJ, Weber FE (2012) Effect of cerium chloride application on fibroblast and osteoblast proliferation and differentiation. Archives of Oral Biology 57:892-897.
4. Garner JP, Heppell PS (2009) Cerium nitrate in the management of burns. Burns 31: 539-547.

Biography

Nilay Kahya is a Ph.D. candidate working under the guidance of Prof. F. Bedia Erim Berker. She completed her MSc degree in Chemistry at ITU Graduate School of Science Engineering and Technology in 2016. Research fields of her are mainly related to the applications of biopolymers in drug delivery systems and adsorption fields. She has three publications in Science Citation Index Expanded journals..

kahyan@itu.edu.tr

Notes:

N. Esmaeili et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Bio-based thermosetting epoxy foam: Tannic acid valorization toward dye- decontaminating and thermo-protecting applications

N. Esmaeili[1,2], A. Salimi[*2], M. J. Zohuriaan-Mehr[2], M. Vafayan[2] and W. Meyer[*1]
[1]Fraunhofer Institute for Applied Polymer Research (IAP), Germany
[2]Iran Polymer and Petrochemical Institute (IPPI), Iran

Bio-resourced thermosetting epoxy foam was synthesized to valorize a sustainable natural product (i.e., tannic acid) toward two different applications e.g., dye-decontaminating and thermo-insulating. Thus, an epoxidized tannic acid (ETA) foam was produced without use of organic volatile compounds or flammable foaming gases. The ETA rigid foam was characterized in terms of physical and thermal properties. The foam density, thermal conductivity and closed-cell content were examined. The polyhedral and closed-cell structure of the foam was also explored by scanning electron microscopy. Furthermore, thermo-stability was investigated to study the impact of the aromatic structure provided by tannic acid, which resulted in high char yield (49% in N2 and 48.3% in air) at 600 oC accompanied by high LOI (37.1 in N2 and 36.8 in air). The high thermo- stability and intumescent char yield along with low thermal conductivity makes the foam to be a promising thermoset for being used as an insulating material. Additionally, sorption of methylene blue (MB, as a model pollutant) onto ETA foam was kinetically investigated. The influence of contact time, ionic strength, solution pH, initial sorbate concentration and desorption were studied, which revealed the strong dependency of the sorption process to pH and initial sorbate concentration. The experimental data fitted well with the Langmuir isotherm (R2 = 0.997), yielding a maximum sorption capacity of 36.25 mg/g. The kinetic data pointed out that MB sorption could be represented by the pseudo second-order model. Overall, the novel ETA foam can be introduced as a candidate for removing cationic pollutants, thermal insulating applications, and self- extinguishing/intumescent materials.

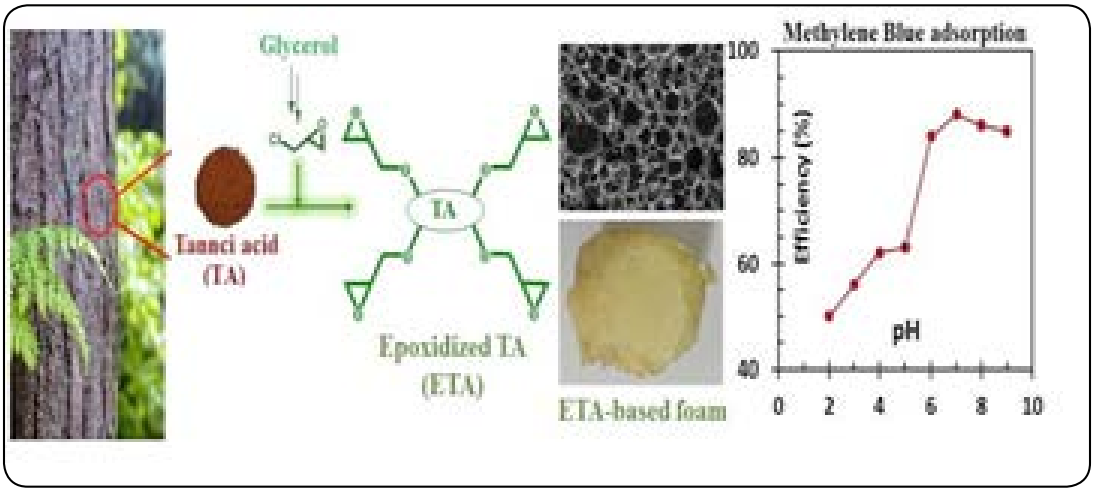


Figure 1. Tannic acid valorization toward epoxy foam and MB. sorption dependency on pH.

Recent Publications

1. Altuna FI, Ruseckaite RA, Stefani PM (2015) Biobased. Thermosetting Epoxy Foams: Mechanical and Thermal Characterization. ACS Sustainable Chemistry & Engineering 3:1406–1411.
2. Xu Q, Wang Y, Jin L, Wang Y, Qin M (2017) Adsorption of Cu (II), Pb (II) and Cr (VI) from aqueous solutions using black wattle tannin-immobilized nanocellulose. Journal of Hazardous Materials 339:91–99.

3. Lang X, Shang K, Wang Y-Z, Schiraldi DA (2015) Low flammability foam-like materials based on epoxy, tannic acid, and sodium montmorillonite clay. Green Materials 3:43–51.
4. Tondi G, Pizzi A, Olives R (2008) Natural tannin-based rigid foams as insulation for doors and wall panels. Maderas Cienciay Tecnologia 10:219–227.
5. Esmaeili N, Vafayan M, Salimi A, Zohuriaan-Mehr MJ (2017) Kinetics of curing and thermo-degradation, antioxidizing activity, and cell viability of a tannic acid based epoxy resin: From natural waste to value-added biomaterial. Thermochimica Acta 655:21-33.

Biography

Naser Esmaeili is a PhD student in the field of bio-based materials and polymer chemistry. His master thesis was about 5-(hydroxymethyl)furfural (HMF) synthesis from fructose and preparation of urea-HMF thermoset resin as a green replacement for UF resin. Now, as a PhD student, he is focusing on bio-based thermoset polymers derived from natural polyphenolic materials such as tannins. He has done some deep evaluation of the synthesized polymers as thermal insulating material, intumescent, wastewater remediation etc.

naser.esmaeili@iap-extern.fraunhofer.de

Notes:

8th World Congress on

Biopolymers & Bioplastics

June 28-29, 2018 | Berlin, Germany

Scientific Tracks & Abstracts

Day 2

Biopolymer Congress 2018

Elena M Ivankova et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Development, investigation and application of composite chitosan-based matrices for tissue engineering

Elena M Ivankova[1, 2], **Irina P Dobrovol'skaya**[1, 2], **Pavel P Popryadukhin**[1, 2] and **Vladimir E Yudin**[1, 2]
[1]Peter the Great St. Petersburg Polytechnic University, Russia
[2]Institute of Macromolecular Compounds - RAS, Russia

Chitosan is well known as the most promising polymer for medical application because it combines bioresorption, absence of cytotoxicity and low environmental impact during processing. The aim of our work was development of the resorbable (biodegradable) 1D-, 2D- and 3D-matrices for proliferation and differentiation of stem cells that is claimed in medicine, biology, pharmacology, bioengineering and tissue engineering. Due to highly hydrophilic nature of chitosan, its properties are unstable and, as result, their strength and rigidity are reduced in the wet state. Therefore, in our laboratory we try to develop and investigate composite materials based on chitosan in order to optimize mechanical properties of final matrices. As 1D-matrices we can produce fibers, which can be used as prototype of muscular tissue and ligaments as well as suture threads. For this purpose we introduce chitin nanofibrils in chitosan-based fibers, aiming at an increase of their stability in wet conditions and variation of resorption time. Composite chitosan-based 2D-matrices – films and fibers felt as prototype of dermal tissue can be produced directly from chitosan solution or by electrospinning method. Such matrices consisting of electrospun chitosan nanofibers shows very good results as wound dressing in combustiology. Chitosan 3D-matrices – sponges as prototype of bones, cartilaginous tissues and tissues of parenchymal organs (liver, spleen, lungs, kidney, pancreas, etc.) – can be modified by incorporation of different nanofillers and then implanted in various parts of living organism.

Biography

Elena M Ivankova has completed her PhD from Peter the Great St. Petersburg Polytechnic University (St. Petersburg, Russia) and then worked as Scientific Collaborator at Institute of Material Science, Martin Luther University Halle-Wittenberg (Halle/Saale, Germany) and at Fracture Physics Department of Ioffe Physical-Technical Institute RAS (St. Petersburg, Russia). Now she is the Senior Scientist in Institute of Macromolecular Compounds RAS (St. Petersburg, Russia). She has published more than 45 papers in reputed journals and has been serving as a Reviewer.

ivelen@mail.ru

Harmaen Ahmad Saffian et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Modification of lignin-based blended with pbs/kenaf core fiber for biocomposites material

Harmaen Ahmad Saffian[1], **Hyun-Joong Kim**[2] and **Paridah Md Tahir**[1]
[1]Universiti Putra Malaysia, Malaysia.
[2]Seoul National University, Republic of Korea.

Statement of the problem: Approximately 50 million tonnes of lignin were generated annually by the chemical pulp industries throughout the world1. The delignification of wood fibres for the production of pulp and paper involved the application of Kraft pulping method. As a by-product of this process, Kraft lignin were generated in abundance annually. Owing to its abundancy, Kraft lignin is gaining favour among the researchers as a feedstock in a variety of fields, aiming to add value to this natural material[2]. Being biodegradable and CO_2 neutral, lignin-based materials are widely recognised as environmentally friendly apart from it relatively lower in cost and stabilizer properties compared to that of synthetic materials[3]. On account to that, application of this industrial by-product could be beneficial from the environmental and economic aspects. Lignin has been proved to have significantly affected the thermal and mechanical behaviour in different polymers4. Furthermore, lignin has also been used as compatibilizer between natural fibres and polymer matrix5. However, due to its poor dispersability in a polymer matrix and low miscibility with polymers, improvement has commonly been made through chemical modification. More potential applications of lignin can be discovered provided that the miscibility of ther lignin with other polymeric materials can be enhanced6. Therefore, this study aims to investigate the effects of incorporation of modified lignin in a synthetic polymer (in the form of copolymers, blends, and composites) on the mechanical and thermal properties of the end products.

Methodology: Maleic anhydride (MA) and lignin were modified using microwave oven method. The mixture was reacted in a microwave and irradiated for 20 min. Findings: Modified lignin-based has enhanced the mechanical properties of the biodegradable polymer after blending.

Conclusion: Modified lignin-based blended with biopolymer and natural fibre using twin screw extruder showed great potential in the production of insulation biocomposites.

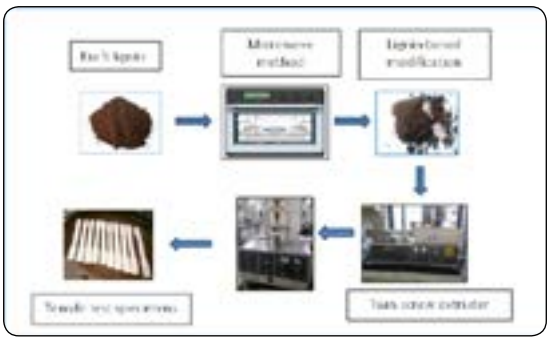


Figure 1: Mechanical properties of Modified Lignin-based for com material.

Recent Publications:

1. Rozite L, Varna J, Joffe R, Pupurs A (2013) Nonlinear behavior of PLA and lignin-based flax composites subjected to tensile loading. Journal of Thermoplastic Composite Materials 26:476–496.
2. Korich A.L, Fleming A.B, Walker A.R, Wangm J, Tang C., Iovine P.M (2012) Chemical modification of organosolv lignin using boronic acid-containing reagents. Polymer 53:87–93.

3. Sahoo S, Misra M, Mohanty A.K (2011) Enhanced properties of lignin-based biodegradable polymer composites using injection moulding process. Composites Part A 42:1710–1718.
4. Bertini F, Canetti M, Cacciamani A, Elegir G, Orlandi M, Zoia L (2012) Effect of ligno-derivatives on thermal properties and degradation behaviour of poly(3-hydroxybutyrate)-based biocomposites. Polymer Degradation and Stability 97:1979–1987.
5. Morandim-Giannetti A.A, Agnelli J.A.M, Lancas B.Z, Magnabosco R, Casarin S.A, Bettini S.H.P (2012) Lignin as additive in polypropylene/coir composites thermal, mechanical and morphological properties. Carbohydrate Polymers 87:2563–2568.

Biography

Harmaen Ahmad Saffian has completed his PhD from Universiti Putra Malaysia, Serdang, Malaysia. He is a Senior Research Officer in Institute of Tropical Forestry and Forest Products (INTROP), UPM. He has more than 20 years' experience in biocomposites. Many papers of his study are related to biocomposites material fabricated using biopolymer and natural fiber as filler. His PhD study was studied on biopolymer compounded with fertilizer for slow released control to produce Bioplastic Fertilizer (BpF) composites. Currently, he is focusing on lignin-based modification compounded with PBS and natural fibre for the production of insulating composite materials. He also has research collaborations with others universities such as Kasetsart University, Thailand, Tehran University, Iran and Seoul National University, Republic of Korea.

harmaen@upm.edu.my

Notes:

Ivana Soljic Jerbic et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Biodegradable synthetic polymers and their application in advanced drug delivery systems (DDS)

Ivana Soljic Jerbic
Pliva Croatia Ltd., CROATIA

Natural and synthetic polymers have been used in pharmaceutical industry for many years and have important role in the development of the conventional dosage forms or for manufacturing of various drug packaging materials. In recent years, their important application resides in the development of the most sophisticated drug delivery systems where polymers are used as a drug carrier. Biodegradable polymers are particularly attractive for application in drug delivery systems since, once introduced into the human body, they do not require removal or additional manipulation. Their degradation products are normal metabolites of the body or products that can be metabolized and easily cleared from the body. Among that, synthetic polymers offer a wide variety of compositions with adjustable properties. These materials open the possibility of developing new drug delivery systems with specific properties (chemical, interfacial, mechanical and biological) for a given application, simply by changing the building blocks or the preparation technique. Such designed complex drug delivery systems where polymers are used as functional excipients have numerous advantages such as localized delivery of drug, sustained delivery of drug, stabilization of the drug, prevention of drug's adverse side-effects, reduction of dosing frequency, minimization of drug concentration fluctuations in plasma level, improved drug utilization and patient compliance. There are range of differently designed drug delivery systems and their description and mechanism of action will be presented in this paper together with the prominent role of the polymers for each particular system. Additionally, most commonly used synthetic biodegradable polymers in drug delivery systems will be presented together with their degradation mechanism.

Figure 1. Classification of polymers used in drug delivery systems (DDS) based on their origin and bio-stability

Recent Publications:

1. Ghandi KJ, Deshmane SV, Biyani KR (2012) Polymers in pharmaceutical drug delivery system: a review. Int. J. Pharm. Sci. Rev. Res. 14: 57-66.
2. Pallerla S, Prabhakar B (2013) Review on Polymers in Drug Delivery. Am. J. Pharm. Tech Res. 3: 900-917.
3. Kaur R, Kaur S (2014) Role of polymers in drug delivery. J. Drug Deliv. Ther. 4: 32-36.
4. Coelho JF, Ferreira PC, Alves P, Cordeiro R, Fonseca AC, Góis JR, Gil MH (2010) Drug delivery systems: Advanced technologies potentially applicable in personalized treatments. EPMA Journal 1:164–209
5. Sackett CK, Narasimhan B (2011) Mathematical modeling of polymer erosion: Consequences for drug delivery. Int. J. Pharm. 418:104-114.

Biography

Ivana Soljic Jerbic, PhD has an expertise in the field of polymer chemistry and development and characterization of new synthetic polymeric materials. Most of her research work consists on investigation of reaction mechanism in complex copolymerization systems together with physico-chemical characterization of the produced copolymers as well as examination of their application properties mainly in advanced drug delivery systems. Most of her scientific work was published in internationally recognized journals in the field of polymer science. For excellence in scientific work in 2010 she won the national award "For woman in science", organized by L'Oréal Adria. She is also an active member of national and international scientific and professional organizations such as: Scientific Council in Croatian Academy of Sciences and Arts (HAZU) - Section for Petrochemistry, Croatian Society of Chemical Engineers and Technologists, International Society of Plastics Engineers etc.

Ivana.SoljicJerbic@pliva.com

Hojjat Mahi Hassanabdi et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Eco bio composites produced by a novel manufacturing method

Hojjat Mahi Hassanabdi[1], **Mohamed Habibi**[2] and **Luc Laperrière**[3]
[1]Centre de recherche industrielle du Québec (CRIQ), Canada
[2,3]Université du Québec à Trois-Rivières, Canada

A novel approach for natural fiber reinforcement manufacturing inspired by a paper-making process is described. The experimental studies focussed on the characterization of composite samples obtained by impregnation of three different types of reinforcement: nonwoven, unidirectional and hybrid. The latter uses short flax fibers as a binder for long fibers, replacing weaving and stitching used in textile-based reinforcements. Benefits of the new manufacturing procedure, in terms of final composites improved mechanical behavior, are discussed. In particular, results show a significant positive effect of the short fiber binder on the transverse tensile and flexural properties. Acoustic emission is further used to study the tested samples damage evolution. The short fiber binder has shown a significant effect on the damage behavior of the hybrid composite. The contribution of the different damage modes (matrix crack, fiber pull-out, fiber breakage, etc.) and the composite failure pattern was strongly influenced by the short fiber binder. In particular a significant decrease of the matrix crack propagation and a flatter rupture surface have been observed.

Recent Publications:

1. Mahi H. H., Habibi. M, Laperrière, L "Influence of low-velocity impact on residual tensile properties of nonwoven flax/epoxy composite," composite tructures (2017 acctepd)
2. Mahi H. H., A. Alemdar, D. Rodrigue "polypropylene reinforced with nano-crystalline cellulose; coupling agent optimization - J. appl. Polym. sci (2014).
3. Mahi H. H., M. Wilhelm, D. Rodrigue "A rheological criterion to determine the percolation threshold in polymer nano-composites - Rheol. Acta (2014).
4. Mahi H. H., D. Rodrigue "Effect of particle size and shape on the reinforcing efficiency of nano-particles in polymer nano-composites, Macromol. Mater. Eng (2014).
5. Mahi H. H., M. Abbasi, M. Wilhelm, D. Rodrigue "Validity of the modified molecular stress function theory to predict the rheological properties of polymer nano-composites", J Rheol. 57, (2013).
6. Mahi H. H., D. Rodrigue "Effect of nano-particles on flow and recovery of polymer nano-composites in the melt state", Int. Polym. Proc (2013).

Biography

Hojjat Mahi Hassanabdi has completed his PhD (2013) and postdoctrola studies (2014) in chemical engineering from Université Laval. He is an R&D agent at CRIQ working mainly on the developement of bio based materails and composites and also plastic recycling. Before joining CRIQ, he was a biomaterials scientist at FPInnovations and also worked for over five years in the polymer and plastics industry.

Hojjat.MahiHassanabadi@criq.qc.ca

Didem Aycan et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Fabrication of reduced graphene oxide-based conductive film for controlled drug delivery applications

Didem Aycan*, Neslihan Alemdar
Marmara University, TURKEY

Nowadays, conductive polymeric materials have been researched extensively and showed great potential for biomedical applications due to the unique properties such as cost effectiveness, strong biomolecular interactions, electrochemical and oxidative stability. They have been widely used in drug delivery systems, biosensors, tissue engineering scaffolds, and neural implants, since their conductive nature allows the stimulation of cells cultured upon them through the application of electrical signal. In this context, novel composite film composed of biopolymers and conductive inorganic additives such as graphene (G), graphene oxide (GO), and reduced graphene oxide (RGO) has been especially preferred owing to some advantages including high electric conductivity at room temperature, excellent mechanical flexibility, long term environmental stability, good electrochemical activity, biocompatibility of biopolymers and also brilliant chemical properties. Herein, RGO-based conductive films were fabricated by incorporation of different amount of RGO into the polymeric network which contains gelatin (Gel), sodium alginate (SA) and hyaluronic acid (HyA) by using a solvent-casting method. The obtained polymeric films were loaded with a model drug and the release kinetic of the drug from the composite film was investigated under the different voltage values. The obtained results assured that RGO-based conductive films could be used as an electro-responsive drug carrier in the future applications.

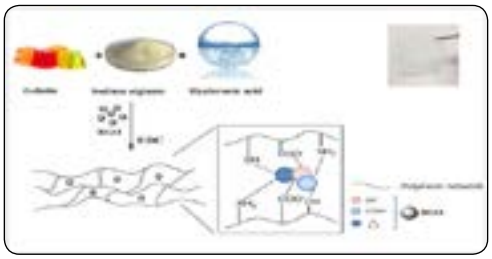


Figure 1. Figure: Schematic diagram of fabrication of RGO-based composite film

Recent Publications:

1. Aycan D., Alemdar N. (2018) Development of pH-Responsive Chitosan-Based Hydrogel Modified with Bone Ash for Controlled Release of Amoxicillin. Carbohydrate Polymers 184:401-407.
2. Aycan D., Alemdar N. (2017) Production Of pH-Stimuli Responsive Hydrogel for Treatment of Gastric Ulcer. Advanced Polymers via Macromolecular Engineering (APME 2017).
3. Aycan D., Alemdar N. (2017) Fabrication of Bone Ash-Reinforced Smart Hydrogel with Enhanced Mechanical and Thermal Performance. European Polymer Federation Congress (EPF 2017).
4. Alemdar N., Uluturk C., Aycan D., Akyuz D., Koca A., Albayrak F.K. (2017) PANI-Based Hydrogel For Glucose Sensıng. International Conference on Applications in Chemistry and Chemical Engineering (ICACCHE 2017).
5. Aycan D., Alemdar N (2016) Chitosan-Based Hydrogel with A High Water Uptake Capacity for Biomedical Applications. 80th Prague Meetings on Macromolecules, Self-assembly in the world of polymers.

Biography

Didem Aycan is currently Ph.D. student in the Department of Chemical Engineering at Marmara University, Istanbul, Turkey. Aycan received her Bachelor Degree from Hacettepe University in Chemical Engineering in 2013 and received her Master Degree from Istanbul Technical University in Chemical Engineering in 2016. During 2013–2016, she worked as a Research Assistant at Istanbul Technical University at Chemical Engineering Department. Her research interests are focused on the synthesis of smart polymers and conductive polymers, their characterizations and its application for drug delivery systems, biosensor and tissue engineering applications and also oil-based film production for coating applications.

didem.aycan@marmara.edu.tr

Joana M R Curto et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Design of Drug Delivery Systems (DDS) made from biopolymers to control the porosity and obtain the desired release kinetics

Joana M R Curto and **Flávia P Morais**
University of Beira Interior, Portugal

The design of drug delivery systems (DDS) made from cellulose building blocks at nano and microscale was done to obtain structures with the desired porosity, and therefore to control the release kinetics of the molecule that is being delivery. The DDS were developed to transport the therapeutic molecule Diclofenac, which is a very effective non-steroid anti-inflammatory drug but induces important gastric mucosa side effects during long term therapeutics. The objective is to develop a biocompatible polymeric system that can retain the drug, avoid its release at the acidic stomach pH, and release it at the alkaline duodenum pH. In the experimental and computational plan design several cellulose based materials were used: carboxymethylcellulose (CMC), nanofibrillated cellulose (NFC) and micro fibrillated cellulose (MFC) having different dimensions and functional bonding groups. The structural characterization was done using SEM image analysis and the pore optimization was done using a validated computational simulator. The results indicated that it was possible to obtain DDS with different pore dimensions and the better combinations were chosen. The nanofibrillated cellulose and microfibrillated were used to form a 3D porous network and the CMC was used to control OH bonding and water affinity. Optimization of the 3D porosity, pore dimension and distribution proved to be determinant to obtain a structure that was able to retain de drug and to release it at alkaline pH. Innovative DDS made form biopolymers have been developed to avoid Diclofenac release in the stomach and prevent the related side effects. The computational simulation proved to be an useful tool to predict the porosity for different combinations of nano and micro fibrillated cellulose fibrous materials. The method used to design these cellulosic porous materials can be used in the formation of other porous materials made from the assembly of polymeric structural units.

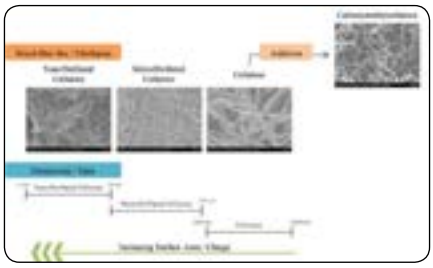


Figure 1. SEM images of structures made from nanofibrillated cellulose, microfibrillated cellulose and carboxymethylcellulose

Recent Publications:

1. Moulton S, Wallace G (2014) 3-dimensional (3D) fabricated polymer based drug delivery systems., J. Control. Release 193:27– 34.
2. Safari J, Zarnegar Z (2014) Advanced drug delivery systems: Nanotechnology of health design: A review, J. Saudi Chem. Soc.18:5-99.
3. Curto, J et al (2015) Development of an Innovative 3D Simulator for Structured Polymeric Fibrous Materials and Liquid Droplets, in Mechanical and Materials Engineering of Modern Structure and Component Design, Advanced Structured Materials, Springer International Publishing, 301-321.
4. Curto, J et al (2011) Three dimensional modelling of fibrous materials and experimental validation, Materialwiss. Werkst., 42:370-374.
5. Jordi, M, Foster, E (2015) Recent advances in nanocellulose for biomedical applications, J. Appl. Polym. Sci., 132:41719.

Biography

Joana Curto has her expertise as a Chemistry Assistant Professor in the development of cellulosic materials for medicinal applications. Her method to design drug delivery systems is based on experimental and computational research developed during her PhD and originated several publication and thesis in porous polymeric materials. She has more than two decades of experience at University of Beira Interior and University of Coimbra research Units and coordinates several cellulose research programs in collaboration with International Research Centers.

joana.curto@ubi.pt

Neslihan Alemdar et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Gelatin-based electro-responsive hydrogel for biomedical applications

Neslihan Alemdar* and **Salise Oktay**
Marmara University, TURKEY

Hydrogels are polymeric materials with three dimensional, cross-linked, hydrophilic structure and their water content which is much more advantageous in terms of their use in tissue engineering, biomedical and biotechnological fields compared to other synthetic biocompatible materials due to their porous and soft structure. Intelligent polymers are polymeric materials which show mechanical and physical changes with external stimuli such as pH, temperature, electric, thus they have widespread usage in controlled drug delivery systems that is one of the most important biomedical fields used in the treatment of diseases such as cancer, chronic pain, which require controlled drug release in the long run. In the light of this information, we produced gelatin-based electro-responsive hydrogels for controlled drug delivery. The obtained hydrogels were characterized by FT-IR and SEM analyses. For the release experiments, a model drug was loaded to the hydrogels and then release kinetics of drug from the gelatin-based hydrogel were investigated under the different voltage conditions. The obtained results showed that gelatin-based hydrogel could be a promising electro-responsive biomaterial for treatment of cancer diseases.

Recent Publications:

1. Didem Aycan, Neslihan Alemdar, "Development of pH-responsive chitosan-based hydrogel modified with bone ash for controlled release of amoxicillin" Carbohydrate Polymers, 184 (2018) 401.
2. Alemdar Neslihan, Leijten Jeroen, Camci Unal Gulden, Hjortnaes Jesper, Ribas Joao, Paul Arghya, Mostafalu Pooria, Gaharwar Akhilesh K, Qiu Yiling, Sonkusale Sameer, Liao Ronglih, Khademhosseini Ali "Oxygen-Generating Photo-Cross-Linkable Hydrogels Support Cardiac Progenitor Cell Survival by Reducing Hypoxia-Induced Necrosis", ACS Biomaterials Science & Engineering, 3 (2017) 1964.
3. Neslihan Alemdar, "Fabrication of a novel bone ash-reinforced gelatin/alginat hyaluronic acid composite film for controlled drug delivery", Carbohydrate Polymers, 151 (2016) 1019.
4. Pelin Yazgan-Birgi, Neslihan Alemdar, A. Tuncer Erciyes, "Styrenated urethane oil synthesis via CuAAC "click" chemistry approach", Prog. Org. Coat. 84 (2015) 107.
5. Nafiseh Masoumi, Nasim Annabi, Alexander Assmann, Benjamin L. Larson, Jesper Hjortnaes, Neslihan Alemdar, Mahshid Kharaziha, Keefe B. Manning, John E. Mayer Jr., Ali Khademhosseini, "Tri-layered elastomeric scaffolds for engineering heart valve leaflets", Biomaterials 35 (2014) 7774.

Biography

Neslihan Alemdar is currently Assistant Professor in the Department of Chemical Engineering at Marmara University, Istanbul, Turkey. Alemdar received her Ph.D. degree from Istanbul Technical University in Chemical Engineering in 2009. During 2011–2013, She worked as a Post-Doctoral Fellowship at Harvard-MIT Health Sciences and Technology Institute & Massachusetts Institute of Technology (Harvard-MIT) at Tissue Engineering Field (USA). Her research interests are focused on the synthesis of smart polymers and characterization and its application for different areas especially the fabrication of hydrogel for tissue engineering application and drug delivery systems.

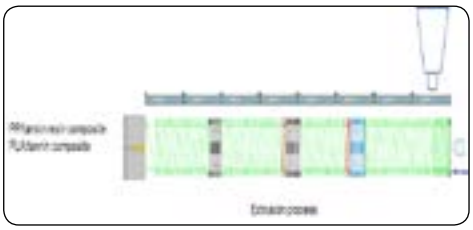
neslihan.alemdar@marmara.edu.tr

Jingjing LIAO et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Natural tannins: potential applications in plastics

Jingjing LIAO[*] and **Sandrine hoppe**
Universite de Lorraine, France

This study presents a polypropylene-based composite processed with tannin resin, which is an eco-friendly thermoset resin with excellent properties, by a dynamically extruded method with the present of maleic anhydride grafted polypropylene (MA-g-PP) as a compatibilizer. The effects of tannin resin content on morphological, mechanical, thermal, and rheological properties were investigated. Tannin resin was successfully dispersed into PP matrix and reinforced the polypropylene matrix. The morphology, which was observed by optical microscopy and scanning electron microscopy (SEM), confirmed that tannin resins were well dispersed in PP matrix as fine particles in diameter range 5-45 μm. The mechanical properties of the composites, studied by tensile and impact test, displayed excellent Young's modulus as the increment of tannin resin content, while negative effects can be found in tensile and impact strengths. The obtained data from dynamical analysis (DMTA) and differential scanning calorimetry (DSC) shown that tannin resin slightly affect the glass transition and melting point. However, low tannin resin content increased the crystallization of the PP matrix. As analyzed by thermogravimetric analysis (TGA), tannin resin enhance the thermal stability of polypropylene. The melting rheological data show that complex viscosity, storage modulus(G'), loss modulus(G") with increasing tannin resins content except 30% tannin resin. Furthermore, tannin resin has the capacity to retard the decompose of PP polymer chains. Recently, poly(lactic acid) /tannins composite filament has been successful used to 3D printing



Recent Publications:

1. Cui, Wang, Zhang, Zhang: Dynamically cured polypropylene/Novolac blends compatibilized with maleic anhydride-g-polypropylene. Journal of Applied Polymer Science. 104, 3337–3346 (2007). doi:10.1002/app.25894 Heilig M, Egli M (2006) Pharmacological treatment of alcohol dependence: Target symptoms and target mechanisms. Pharmacology and therapeutics 111:855-876.
2. Chiang, Wu, Pukánszky: Modification of polypropylene, blending with resole type phenol-formaldehyde resins. (1994)
3. Bream, science HPOM: Comminuted thermoset recyclate as a reinforcing filler for thermoplastics Part II Structure—property effects in polypropylene compositions. (2001)
4. Ambrogi, Cerruti, Carfagna, Malinconico, Marturano, Perrotti, Persico: Natural antioxidants for polypropylene stabilization. Polymer Degradation and Stability. 96, 2152–2158 (2011). doi:10.1016/j.polymdegradstab.2011.09.015
5. Böhm, Hauptmann, Pizzi, Friedrich, Laborie: The chemical, kinetic and mechanical characterization of tannin-based adhesives with different crosslinking systems. International Journal of Adhesion and Adhesives. 68, 1–8 (2016). doi:10.1016/j.ijadhadh.2016.01.006

Biography

Jingjing LIAO has a background of wood science. Her passion is to broaden the usage of a kind of biopolymer -- tannin. This biopolymer can be easily extracted from a highly abundant residues from wood bark. Tannin resin, which is an eco-friendly thermoset resin with excellent properties, have been used for wood bonding since last century. However, it is rarely found the application beyond wood composites. She tried to use tannin resin, a natural thermoset resin, as a polypropylene component based on the research about thermoplastic and thermoset blending.

jingjing.liao@univ-lorraine.fr
Sandrine.hoppe@univ-lorraine.fr

Leire Urbina et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-011

Two different routes for the preparation of bacterial cellulose/chitosan filtration membranes for copper removal in wastewaters

Leire Urbina, Gabriel Arner, Nagore Gabilondo, Arantxa Eceiza, Maria Angeles Corcuera and **Aloña Retegi**
University of the Basque Country (UPV/EHU), Spain

The presence of copper ions in wastewaters is a very serious problem extended in the electrical, leather, fungicidal or paper industries[1]. Recent research is focused on the development of chitosan (Ch) membranes for wastewater purification processes since this biopolymer contains a large number of free amino groups which are highly reactive for the chelation reaction of metal cations[2]. Traditionally, glutaraldehyde has been used as a cross-linker of Ch to improve the chemical and mechanical resistance of the membranes, but its main drawback lies with the toxicity[3], so other alternatives are being investigated. In this context, nanocellulose materials have also gained attention in this area due to their mechanical performance and high specific surface area[4]. Bacterial cellulose (BC), a biopolymer biosynthesized by some bacteria, offers new possibilities in this field due to its highly crystalline 3D network-like structural conformation with excellent mechanical properties in wet state[5]. In this work, environmentally friendly membranes by *in situ* and *ex situ* routes based on BC as a template for the Ch as functional entity for the elimination of copper in wastewaters have been developed. BC/Ch composites were prepared *ex situ* by immersing the previously biosynthesized BC wet membranes in 0.6 and 1% (v/v) Ch prepared in 0.5% acetic acid solution under shaking conditions. BC/Ch composites were prepared *in situ* by the supplement of chitosan (addition of 0.50 and 0.75% (w/v) Ch) into the culture medium used for the BC biosynthesis. The influence of the preparation route on the interactions between components, mechanical properties, morphology, and pore structure was evaluated. Two routes led to bionanocomposites with different aspect and physico-chemical properties. The morphological characterization suggested a better incorporation of Ch into BC matrix through the *in situ* route. Finally, the cooper removal capacity of these membranes was analyzed and the reusability of the membranes was assessed.

Recent Publications:

1. Karim, Z., Mathew, A., Grahn, M., Mouzon, J., & Oksman, K. (2014). Nanoporous membranes with cellulose nanocrystals as functionalentity in chitosan: Removal of dyes from water. Carbohydrate Polymers. 112: 668-676.
2. Wang, B., Zhu, Y., Bai, Z., Luque, R., & Xuan, J. (2017). Functionalized chitosan biosorbents with ultra-high performance, mechanical strength and tunable selectivity for heavy metals in wastewater treatment. Chemical Engineering Journal. 325: 350-359.
3. Mitra, T., Sailakshmi, G., & Gnanamani, A. (2014). Could glutaric acid (GA) replace glutaraldehyde in the preparation of biocompatible biopolymers with high mechanical and thermal properties. Journal of Chemical Sciences. 126: 127-140.
4. Karim, Z., Claudpierre, S., Grahn, M., Oksman, K., & Mathew, A. (2016). Nanocellulose based functional membranes for water cleaning: Tailoring of mechanical properties, porosity and metal ion capture. Journal of Membrane Science. 514: 418-428.
5. Hu, W., Chen, S., Yang, J., Li, Z., & Wang, H. (2014). Functionalized bacterial cellulose derivatives and nanocomposites. Carbohydrate Polymers. 101: 1043-1060.

Biography

In 2015 Leire Urbina earned a PhD grant funded by the Basque Government and incorporated as a researcher to the "Materials + Technologies" Group in the Department of Chemical and Environmental Engineering of the UPV / EHU. Strong background in polymers, advanced materials and nanotechnology and biotechnology areas. Her research is based on the use of biomass by-products and wastes for the production of new materials with high added value that can be used in various industrial sectors. Concretely she is working in the development and optimization of biosynthetic pathways to produce biopolymers via bacteria (bacterial cellulose and polyhydroxyalkanoates) using agricultural residues as a source of nutrients and the processing of their bionanocomposites. The investigation is focused on the influence of biosynthetic conditions on the final properties and generated micro/nanostructures and the development of functional (bio)nanocomposites with improved properties for applications in biomedicine and for environmental uses in the elimination of pollutants in wastewaters.

leire.urbina@ehu.eus