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October 19-20, 2017 San Francisco, USA

Scientific Tracks & Abstracts

Day 1

Baki Hazer, J Bioremediat Biodegrad 2017, 8:6 (Suppl)
DOI: 10.4172/2155-6199-C1-011

Precious metal nano composites based on autoxidized unsaturated plant oils/fatty acids

Baki Hazer
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Unsaturated plant oils/fatty acids (UPOFA) have gained great interest as monomers to produce bio based polymers. UPOFA is prone to react with air oxygen under daylight at room temperature which is called "ecofriendly autoxidation". Eco-friendly autoxidation process creates peroxide linkages in order to obtain unsaturated plant oil/fatty acid polymer that can initiate the free radical copolymerization of some vinyl monomers. In addition, water soluble hydroxylated plant oil and nano composite materials are synthesized using autoxidized unsaturated plant oils/fatty acids (AUPOFA). Autoxidized oleic acid macroperoxide initiated the free radical polymerization of styrene in order to obtain carboxyl functionalized polystyrene for further modification reactions. In this manner, polyethylene glycol with amine terminal groups were reacted with this polymer. Multi block amphiphilic copolymer was used to stabilize inorganic nanoparticles to obtain organic/inorganic nanocomposites.

Catalyst effect of gold NPs is dramatically decreased the eco-friendly autoxidation time. For example the gold catalyzed autoxidized soya oil polymer was obtained in ten days oxidation period while the autoxidation time takes nearly one month to obtain oxidized soya oil polymer without Au NPs. Similarly, high fluorescent emission of silver/oxidized soybean oil polymer nanocomposite is obtained. The nanocomposite solutions were analyzed by UV-VIS spectrometer in view of the surface plasmon resonance. TEM was used to characterize size and shape of the metal nano particles embedded into the copolymer nano composites.

Biography

Baki Hazer received his M.S. and B.S. degrees in chemical engineering from the College of Chemical Engineering, University of Istanbul, in 1972 and his PhD degree from Karadeniz Technical University, in 1978. He received the Royal Society of Chemistry and TÜBİTAK joint research grant at the Liverpool University in the United Kingdom. He received the NATO Collaborative Research Grant at the Department of Polymer Science and Engineering, University of Massachusetts, Amherst in 1995–1997, and was Fulbright Visiting Professor at the same department in 1992–1993. He was a Visiting Scientist at The University of Akron in 2007. He had an honorary membership by the Turkish Chemical Society in May 2005. He is a Member of the Turkish Chemical Society and Member of the Editorial Boards of Hacettepe Journal of Biology and Chemistry and Journal of Clinical Rehabilitative Tissue Engineering Research (CRTER). He is specialized in soybean oil polymers and post polymerization reactions, nanocomposite synthesis, bacterial polyesters, block and graft copolymers, macro monomeric initiators, controlled leaving polymerization, and thermoresponsive polymers.

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Steven K Henning, J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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The synthesis and characterization of farnesene-based polyols

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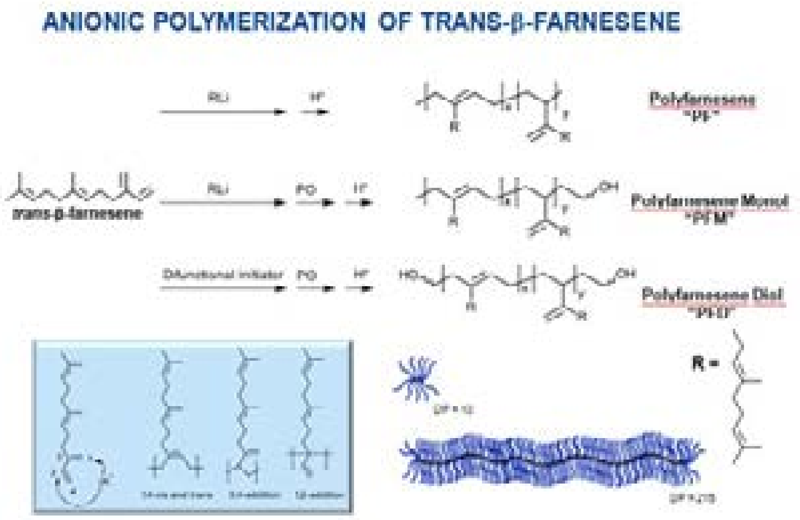
A bio-based route to the production of *trans*-β-farnesene has recently been commercialized. *Trans*-β-farnesene is capable of being polymerized by both anionic and cationic pathways, creating low molecular weight polymers with structure-property relationships unique within the diene class of monomers.

Trans-β-farnesene is produced through fermentation of sugar feedstocks. The pathway offers an alternative to petroleum-based feedstocks derived from cracking processes. Anionic polymerization of the monomer produces a highly branched "bottle-brush" structure, with rheological and thermal properties that are markedly different than those of traditional linear diene polymers. Specifically, a lack of entanglements is observed even at relatively high molar masses.

The synthesis and characterization of *trans*-*β*-farnesene-based polymers will be presented, including anionically prepared low molecular weight diols and monols. Their utility as novel polyols in various end-use applications such as prepolymers for polyurethane synthesis will be reviewed.



Biography

Steven K. Henning is Total Cray Valley's Global Director for Research and Development. Henning previously managed the Rubber Applications Lab for the Sartomer Company. His career began at The Goodyear Tire and Rubber Company in Akron, OH working for the Exploratory Polymer Research group as part of Corporate Research, North American Tire Division, and later for Goodyear's Chemical Division as Team Leader for Anionic and Emulsion Polymer Development. Henning received his BS degree in Materials Science and Engineering from The Pennsylvania State University and was conferred a master's degree in Polymer Science from the University of Akron. He is inventor on over 20 US and international patent files and has published extensively in the area of polymer science.

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Notes:

Dirk W Grijpma, J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Poly(trimethylene carbonate) polymers and networks, Synthesis, properties and medical applications

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Poly(trimethylene carbonate) (PTMC) is an amorphous polymer with low glass transition, and is prepared by ring opening polymerization of the cyclic trimethylene carbonate (TMC) monomer. It can be copolymerized with other lactone monomers to yield materials with tuneable physical and chemical properties. Upon crosslinking flexible and elastic (co)polymer networks are obtained, with properties that resemble those of poly(dimethyl siloxane) (PDMS) rubber. Interestingly, the TMC monomer can be prepared from natural renewable resources using 1,3-propane diol that is obtained by fermentation of glucose.

While PTMC with number average molecular weights below 50000 g/mol are viscous or gummy materials with poor mechanical properties, high molecular weight linear PTMC is an amorphous, tough and flexible solid with a low glass transition temperature of -19 °C. The resistance to creep of the flexible polymer significantly increases when it is crosslinked. PTMC networks can be prepared by gamma-irradiation of linear high molecular weight PTMC polymer or by photo-crosslinking functionalized macromers based on TMC using UV-or visible light.

Materials based on PTMC are very useful in biomedical applications. Linear (co)polymers and (co)polymer networks prepared from TMC and D,L-lactide or e-caprolactone were shown to be compatible with a large number of cells and implantation experiments in small animals showed only a mild tissue response. PTMC based polymers and networks were found to degrade in the body by an enzymatic surface erosion mechanism, without the release of acidic degradation products. This makes these polymers very well-suited as a matrix in the preparation of biodegrade composite materials for bone tissue engineering and drug delivery.

Here we will present work on the synthesis and properties of PTMC polymers and networks, their processing into medical implants by conventional processes and advanced additive manufacturing methods and their characteristics in the presence of cells and upon implantation.

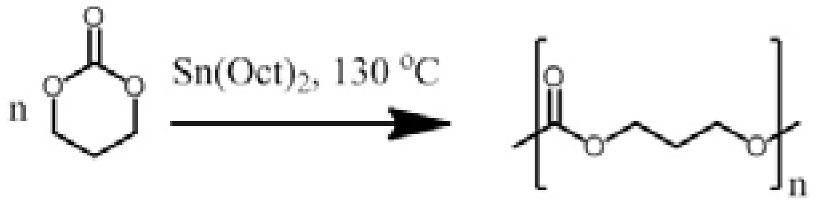

Figure 1: Ring-opening polymerization of trimethylene carbonate (TMC) using stannous octoate (Sn(Oct)2) as catalyst to obtain high molecular weight poly(trimethylene carbonate) (PTMC).

Biography

Prof. Dr. Dirk W. Grijpma is professor and head of the department of Biomaterials Science and Technology at the University of Twente. He also holds a part-time professorship in the Development and Clinical Application of Biodegradable Polymers at the University Medical Center Groningen. His expertise is in the synthesis, advanced processing and properties of (degradable) polymeric materials for use in medical devices, tissue engineering and in the delivery of relevant biologically active compounds. His research also includes the interaction of these materials and devices with cells and tissues. He is editorial board member of Biomaterials, Acta Biomaterialia, the Journal for Applied Biomaterials and Biomechanics, the Journal of Orthopedic Translation and the Journal of Medical Materials and Technologies. He was elected Fellow Biomaterials Science and Engineering (FBSE) in 2008. Professor Grijpma is (co)author of more than 235 refereed scientific publications and is (co)inventor on 24 international patent applications.

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Sheng-Ju Liao et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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7th International Conference and Exhibition on
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Evaluation of thermoplastic starch and lignin as renewable fillers in styrene-butadiene rubber system

Sheng-Ju Liao, Shihn-Juh Liou and **Chen-Yu Huang**
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Statement of the problem: According to the Japan Rubber Manufacturers' Association, the total amount of carbon dioxide consumed from each passenger tire is 296.4 kg. Approximate 87% (equivalent to 258 kg) of carbon dioxide is discharged at the stage of use. The development of environmentally friendly energy-saving tires is the goal of global tires' manufacturers. Goodyear and Novamont have collaborated to produce BioTRED using corn starch to replace parts of the lamp black and silica in rubber matrix. It has been approved by both Ford and BMW. The purpose of this study is used non-food biomass resources such as typical starch and lignin as renewable fillers in the styrene-butadiene system. Methodology & Theoretical Orientation: To develop the energy saving tires with excellent wet traction and rolling resistance, the important fundamental properties such as viscoelastic behaviors of composite materials were investigated. Findings: Thermoplastic starch (TPS) and lignin bio-fillers were used to replace parts of the carbon black and silica, which were normally contained in the tire tread mixture. The starch/lignin were incorporated from 5 to 20 parts per hundreds of rubber (phr). Dynamic Mechanical Analyzer (DMA) test confirmed these two kinds renewable fillers are helpful for improving wet grasping performance (i.e., evaluated at tan δ 0^0C) and reducing the rolling resistance (i.e., evaluated at tan δ 60^0C) of tire tread. The Payne Effect test showed that the incorporation of 15 phr modified TPS to replace silica could improve dispersion of reinforcing fillers in rubber composited system. Conclusion & Significance: There are many advantages by introducing non-food biomass renewable fillers to styrene-butadiene rubber system. They can enhance tire wet grip, lower rolling resistance, and reduce carbon dioxide emissions. There is also a “lightweight” advantage because the density of TPS is just half of silica. Moreover, the energy saving processing can be reached.

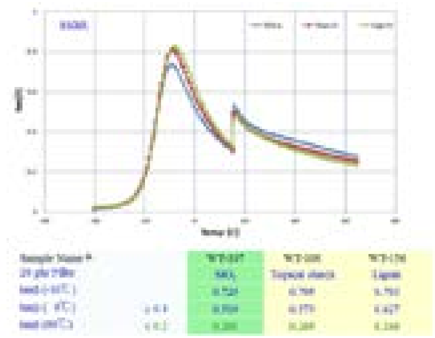

Figure 1: Wet grip and rolling resistance evaluation of different kinds fillers

Biography

Sheng-Ju Liao received her PhD degree in Chemistry from National Tsing Hua University, Taiwan. She works as a research fellow and project leader at Industrial Technology Research Institute (ITRI), Taiwan. She has more than 10 years of R&D experience in the field of biocomposite materials. Her expertise includes biomass monomer purification, polymerization, reactive extrusion, blending processing (e.g., injection molding, compression molding, and foaming), and assessment in industrial application. She holds sixteen patents and several cooperated partners from the industry, such as BenQ, Chiaofu Group, Cheng Shin Rubber, Pou Chen Group… etc...

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Notes:

Fabio Codari et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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From lab to an industrial scale Sulzer PLA technology

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In the last years, PLA has gained significant market attention, with several large brand owners announcing evaluation of this material or even launching new solutions based on PLA as a sustainable alternative to existing fossil-based plastics in packaging and thermoplastic applications. Bio-based, biodegradable, versatile, temperature resistant and suitable for food contact applications: PLA offers a variety of advantages and benefits. But, it is also a sensitive material requiring special conditions during production and processing. With regards to temperature control and shear, advanced technology is required to obtain a product with high crystallinity and molecular weight, combined with low residual monomer and yellowness index, allowing the material to match and even exceed technical expectations and standards set by the existing thermoplastics. Sulzer has developed a flexible and robust PLA production technology to enable PLA producers to enter the biopolymer market at customizable scale. The process was scaled-up from lab scale bench tests and extensive pilot testing to large production capacities and it is nowadays state-of-the-art in PLA technology. The Sulzer PLA technology is discussed in the first part of this work with focus on process design and the Sulzer proprietary key equipment. In the second part, the scale up of the ROP process from laboratory to industrial scale is presented.

Biography

Fabio Codari is a graduate of the Politecnico di Milano in chemical engineering and holds a PhD in polymer science from the Swiss Federal Institute of Technology of Zurich (ETHZ). He has been working for Sulzer Chemtech for six years in various R&D, sales and application development positions. His main fields of expertise are polymerization, devolatilization and upgrade polymer processes.

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Hamed K Abbas et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Bioplastic formulations for the delivery of beneficial microbes to control agricultural pests

Hamed K Abbas, C. Accinelli, and **W. T. Shier**
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Biocontrol agents are beneficial microbes used to control agricultural pests including fungi, insects, weeds, and bacteria. Their efficacy depends on effective formulations and delivery systems to facilitate production, maintain viability during storage, facilitate field application and enhance effectiveness on crops. Starch-based bioplastics possess a number of unique properties that make them advantageous for biocontrol formulations. They are available in various forms that facilitate delivery and efficacy. In each form used, the starch component of the bioplastic plays key roles. In granule formulations, the starch-based bioplastic component enables adsorption of spore suspensions with good viability retention and provides a nutrient source for the fungus after application. In sprayable liquid formulations, the starch component allows heat-induced gelatinization of finely-divided particles, which can then deform to pass through a sprayer head, and enhance adherence to leaf surfaces, as well as providing the spore suspension adsorption and nutrient provision advantages. In seed coating, spray-coated bioplastic formulations provide a stable, adherent nutrient source with excellent dust-generation resistance and viability retention. Bioplastic granules coated with spores of non-aflatoxigenic *Aspergillus flavus* spread on maize (corn) field soil reduces levels of aflatoxigenic *A. flavus* in soil and aflatoxin contamination in harvested kernels by 97%. Biocontrol *Trichoderma* species in bioplastic granules reduce fungal infection of emerging roots by 85% in tomatoes, impatiens and bluegrass. Coating seeds with bioplastic containing *Trichoderma* species helps prevent fungal infection of roots of germinating seedlings, preventing root rot. Sprayable liquid bioplastic dispersion formulations of *Beauveria bassiana* significantly reduced damage caused by European corn borer in maize and tarnished plant bug in cotton, and delivered *Bacillus thuringiensis*endotoxin crystals to European corn borer larvae, causing 72% mortality. Bioplastic formulations have proven effective delivery vehicles for several microbial biocontrol agents in treating or preventing agriculturally-important plant diseases, but improved methods are being sought to enhance cost-effectiveness.

Biography

Dr. Hamed Abbas has been the lead scientist in the aflatoxin control project since 1999. The focus of Dr. Abbas' research is reduction of corn contamination with mycotoxins (especially aflatoxins and fumonisins) by studying agricultural practices, varietal resistance, fungal ecology, and biological control. He developed a sensitive, inexpensive method to identify aflatoxigenicity in *Aspergillus* isolates. Currently Dr. Abbas is cooperating with an industrial partner (Syngenta) to further develop and refine application methods for two promising aflatoxin biocontrol strains. Dr. Abbas has 27 years of post graduate research experience and he has authored or co-authored 261 publications (212 refereed research journal articless, 50 review articles/book chapters) and over 200 abstracts. He has received 7 patents for his work on mycoherbicides and aflatoxin control. Dr. Abbas has been recognized worldwide as an authority on mycotoxin contamination in the field, and in food, and for his work on mycoherbicides.

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Notes:

Nathanaël Guigo et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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The poly(ethylene 2,5-furandicarboxylate): A new emerging biobased polyester from sugar stream

Nathanaël Guigo[1], **Nicolas Sbirrazzuoli**[1], **Jesper van Berkel**[2] and **Ed de Jong**[3]
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Poly(ethylene 2,5-furandicarboxylate) (PEF) is nowadays considered as a promising sustainable successor of poly(ethylene terephthalate) (PET) for several reasons. First, PEF is fully biobased since it comes from the polycondensation of bio-based ethylene glycol and 2,5-furandicarboxylic acid (FDCA) which is the chemical analogue of the terephthalic acid. FDCA is currently produced by Synvina at pilot plant scale from a C6 sugars conversion process of vegetable biomass. Synvina - the joint venture between Avantium and BASF - aims at building a world-leading reference plant with an annual production capacity of up to 50,000 metric tons of FDCA per year.

PEF possesses superior barrier properties and more attractive thermal properties (e.g., higher glass transition temperature and lower melting point) than PET. The low CO_2, O_2 and H_2O permeability of PEF is a tremendous advantage for packaging applications. In order to fill the requirements of industrial applications a deep knowledge of polymer structure-property relations is needed. An important aspect for both the production and application of aromatic polyesters such as PEF is their crystallization behavior. Semi-crystalline pellets/chips are used in the solid state polymerization reactor to avoid agglomeration or sticking during the process, which are initially prepared by quiescent crystallization of medium molecular weight polyester. PEF crystals either formed from the glass or from the melt show similar structures but the dynamic of crystal growth differs between the two crystallization pathways. Moreover, annealing at temperatures close to the PEF melting point allowed obtaining information on PEF self-nucleation behavior. Finally, the restriction of the amorphous phase mobility by the presence of crystals is more limited in comparison with PET.

Figure 1: Sketch representing the coupling between the amorphous phase (red for PET and green for PEF) and the crystalline phase

Biography

Nathanaël Guigo received his Ph.D. in 2008 from the University of Nice Sophia Antipolis (France) in the field of furanic based polymers. He joined the Centre de Recherche sur les Macromolécules Végétales (Grenoble, France) as a post-doctoral fellow to work on cellulosic fibers in high performance composites. In 2010, he became associate professor and in 2013, he obtained a secondment to Avantium (Amsterdam) to work on the poly(ethylene 2,5-furandicarboxylate). His scientific work has been published in more than 35 papers or book chapter and he has been actively involved in three EU projects relative to the valorization of biomass into new materials.

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Notes:

Camila A F M Souza et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Soil contamination caused by necroslurry polymer

Camila A F M Souza[1], **Juliana S. M. Guedes**[2], **Maria Alzira P. Dinis**[2] and **Barbara L. Rosa**[1]
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An organic compound named necroslurry is yielded from human body decomposition. It is one of the main contaminants present in horizontal cemeteries. This compound is highly toxic to humans, and can spread diseases through its contact with insects and water, because it has the ability to percolate the soil carried by water. Necroslurry is mainly composed by cadaverine ($C_5H_{14}N_2$), and it is a liquid of high viscosity due to the internal chemical reactions that produce polymers, which makes it difficult to be transported and removed from soil and groundwater. Considering the complexity to recover a soil that is already contaminated with these polymers, it is necessary to enhance technologies that favor gas exchange during decomposition. Taking into account the polymerization of necroslurry, it is required to carry and treat it in the gas phase. In Brazil, a technology associated with vertical cemeteries has been developed, which provides the gas exchange controlling humidity levels, temperature and pressure, preventing the formation and percolation of polymers intp the environment. Consequently, this procedure will avoid the contamination caused by necroslurry.

Biography

Camila Alda Farhat Magalhães Souza holds a degree in Psychology at *Universidade FUMEC*. Specialist in Afro-Brazilian History and Culture from *UNIANDRADE*, 2nd Lieutenant of the Brazilian Air Force, Psychologist. Currently, works as a clinical psychologist, researcher and literary reviewer.

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Notes:

Luciana N Magalhães et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
DOI: 10.4172/2155-6199-C1-011

The use of recycled polymer in the decrease of moisture in concrete slabs used in cemeteries

Luciana N Magalhães[1], **Juliana S. M. Guedes**[3], **Stéphanie S. R. D. Morais**[2], **Ariádina S. Menezes**[2] and **Maria Alzira P. Dinis**[3]
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The conventional concrete together with masonry are the building processes used in Brazil at the traditional cemeteries, named horizontal cemeteries. They are, composed of shallow graves and burial chambers. The physical and mechanical characteristics of the structural materials influence pathologies that may occur affecting both the integrity of the tombs and the environment in which they are settled. The alkali-aggregate reaction, RAA, consists of a chemical reaction that occurs in mortars or concretes, between the hydroxyl ions (OH-), mineralogical constituents of the aggregates, related to the alkalis sodium oxide (NA_2O) and potassium oxide (K_2O) from the Portland cement itself or from other sources. The product of this reaction is the formation of the expansive gel, arising from the deterioration process of the hardened concrete that causes from the destruction of structures and cracks, to the reduction of tensile and compressive strengths. These pathologies affect the durability and safety of concrete structures, which are enhanced by the presence of moisture. The higher the humidity, the greater the expansion. The lubricity comes from several conditions such as, whether the water/cement factor is higher than necessary or the relative humidity is greater than 85%, among other reasons. Burial buildings in cemeteries must be more resistant, due to the fact that in its internal space the very process of body decomposition and the release of necroslurry attacks and affects the structure, in addition to external factors (environment), such as temperature, that may wear out different types of materials. By increasing the polymer chain, the coefficient of expansion also expands, thus making burial buildings more resistant. Permeability and oxidation are two of the most important chemical properties among others. To stop humidity from enhancing the occurring pathologies, it is convenient to reduce this internal moisture in concrete structures with the use of waterproof agents. Keeping this in mind, this article intends to evaluate the use of recycled polyethylene terephthalate (PET) polymer in the structures of burial buildings at vertical cemeteries When evaluating the efficiency of these techniques, the state of art of the vertical cemetery located in Recife, the capital of the state of Pernambuco, Brazil was assessed and taking into account the lack of research approaching these subjects, the results of works developed in loco are presented. Advantages and drawbacks of the application of polymers in the conventional concrete mix to reach the reduction of moisture. We have also pointed out proposals of solutions concerning the conditions the structure is submitted to.

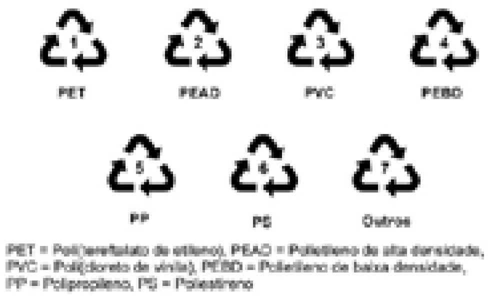

Figure 1 – Symbology used to identify polymer packages. Standard NBR 13.230 of ABNT (Brazilian Association of Technical Standards)

Biography

Luciana Nunes de Magalhães holds a degree in Civil Engineering from Universidade FUMEC, a master's degree and a PhD in Structural Engineering from Universidade Federal de Minas Gerais. Currently, is a professor at Pontifícia Universidade Católica de Minas Gerais and provides updated courses for engineers and architects in the construction / structural systems area at CREA MG. Has professional experience in the Structural Engineering field, besides publications in magazines and congresses, with emphasis on those systems.

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Juliana S M Guedes et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Necroslurry polymer transportation through pipes

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A conventional burial, considering its environmental aspect, has a reality that contrasts with the social, cultural and religious beliefs of most people. After burial in graves or chambers, in addition to decomposition by bacteria, the body is also consumed by insects. Such animals enter through cracks in the concrete, masonry and wood, depending on the type of the burial construction. Consequently, these insects that had access to a corpse become disease transmitters. Therefore, animals' access to bodies in decomposition can bring discomfort to those people who live around the cemetery. It also causes discomfort to visitors. The insects that gather in such places denote a lack of dignity for the person buried in the spot. A decaying human body generates a substance called necroslurry. It is a liquid released during the corpse decomposition process and is composed of water, minerals and organic substances, which are responsible for the contamination of the soil and possible underground aquifers in the cemetery area. The soil is not prepared to receive this type of compound, so the consequences can be irreparable damages to this environment. The viscosity of the necroslurry is due to the chemical reactions that produce polymers. So, necroslurry is viscous, with a mean density of 1.23g / cm^3 (greater than the water density) and is polymerizable. Necroslurry drying tests have already been carried out and showed that the liquid is polymerized and pulverized at 1 liter every 84 hours and is reduced to about 50 grams of a whitish inert powder. The decomposition of organic substances in the corpse can produce diamines such as cadaverine ($C_5H_{14}N_2$) and putrescine ($C_4H_{12}N_2$), which when degraded, generate NH_4^+, a substance with high concentration levels of toxicity. As necroslurry is a polymerizable substance, it is difficult to transport it in the liquid phase. To prevent social discomfort and environmental problems inherent to soil and water, it is necessary to develop a system that prevents leakage of the necroslurry into the external environment. A fully leak-proof technology associated with the vertical cemetery has already been developed in Brazil. This system has proved to be very efficient in the cities where it is being applied. Due to the difficulty to transport the necroslurry in the liquid phase because of the polymers, this system deals with the necroslurry in its gas phase, which makes its transportation feasible.. Although, the solution for this challenge proves to be troublesome due to the negligence and lack of interest from governments and most people, there is an immense and immediate need to control cemetery contamination toward the environment. And, this solution would still bring much more dignity to burials than most of other systems carried out today.

Biography

Juliana da Silva e Mascarenhas Guedes holds a degree in Civil Engineering from Universidade Federal de Minas Gerais, a Master's Degree in Structural Engineering from Universidade Federal de Minas Gerais, a PhD in Earth Sciences from Universidade Fernando Pessoa, in Porto, Portugal. Currently, is a professor of Civil Engineering at Universidade FUMEC and post-graduate in Structural Engineering from Universidade FUMEC. She is an investigator at FP-ENAS, UFP Energy, Environment and Health Research Unit, Porto. Has experience in the structural and sanitary area. Articles in papers in sanitation, environmental and structural área.

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Development and characterization of polysaccharides/carrageenan based biofilms

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[3] Department of Chemistry, Anna University, India

The research and development of biofilms becomes interesting and their usages are increasing in recent days.The biofilms are generally produced from natural materials like lipids, proteins and polysaccharides. Starch is a renewable and abundantly available material which is suitable for making biofilms. An attempt has been made in the present work to develop a biofilm from the starch of tapioca root and rice boiled water. The film casting solutions were prepared by varying the concentration and gelatinization of starch and carrageenan. Two different sources of starch and three concentrations of carrageenan (0.5%, 0.75 % and 1%) were used with and without adding 0.5% glycerol (food grade) as plasticizer to prepare film casting solutions. The results show that all solutions behave as non-Newtonian pseudo-plastic liquid and follow the power law relationship. The films were produced by solution casting method. The mechanical and barrier properties of starch/carrageenan cast films were investigated. The optical, porosity and printability properties of starch/carrageenan blends were also studied. The selected biofilms samples were also analysed for surface characteristics and uniformity using Scanning Electron Microscope output images. FTIR analysis was done to identify the functional group of the samples. It is found that the mechanical and barrier properties of the cast films increase with increasing carrageenan content.

starch / carrageenan film

Biography

Mrs. J.P. Nirmala, is a graduate in Printing Technology (CEG, Anna University) and completed Post graduation in Computer Science and Engineering (IIT, Madras) in the year 2008. She has more than 15 years of teaching experience and two years of industrial experience. She has guided around 10 PG projects. Her research interest is in finding environmentally safe packaging materials for disposable consumer products.One of her other objective is to prepare biofilms from agri/food industrial waste which is quickly degradable.

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Notes:

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Mechanical stability of wood flour / polyhydroxyalkanoate (PHA) composites modified by boron nitride and talc

Clement Chan[1], **Luigi-Jules Vandi**[1], **Steven Pratt**[1], **Peter Halley**[1], **Desmond Richardson**[2], **Alan Werker**[1,3] and **Bronwyn Laycock**[1]
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The wood plastic composites (WPCs) market has been rapidly expanding over the past few decades. Recently, the use of polyhydroxyalkanoates (PHAs) as the polymer matrix in WPCs has been of increasing interest, as these polymers are renewable, biodegradable and have a low melt viscosity. However, there have been concerns over the slow crystallisation rate and in-service stability of such bioderived and biodegradable materials. The aim of this study is to investigate the individual and combined effect of boron nitride (BN), a nucleating agent, and talc, a micron-sized inorganic filler, on the properties of a composite made from radiata pine wood flour and poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) polymer (50/50 by weight) and their in-service mechanical stability. In this study, wood composites were manufactured using twin screw extrusion and their mechanical and thermal properties were experimentally determined initially and after 1 year of conditioning under a controlled temperature of 25°C and humidity of 50%. The nucleating effects of both BN and talc were demonstrated through isothermal crystallisation kinetic analysis, with BN being more effective. No further observable improvements were noted when these additives were combined compared to the use of BN alone. However, the addition of 1 wt% of BN was not found to affect the tensile properties initially nor after 1 year of controlled aging. After conditioning, the mechanical properties of the composite without additives were retained. Inherent in-service mechanical stability for such biocomposites is therefore possible. The addition of talc improved the initial tensile strength and tensile modulus of the composite. However, such initial improvement in mechanical performance was reduced after 1 year of conditioning. It is proposed that the combination effects of multiple factors such as the swelling of wood through moisture uptake, the shrinkage of PHBV through secondary crystallisation and the localised stress around talc particles could led to a weakened talc-PHBV interface.

Biography

Clement is currently a PhD student at the School of Chemical Engineering, the University of Queensland, Australia. His major experiences are in functional materials and composites. He graduated with a Bachelor's of Chemical Engineering from the University of Minnesota - Twin Cities, U.S.A. During his studies, he also involved in a project focused on the toughening of graphene-epoxy nanocomposites through the functionalisation of graphene. After working as a production engineering in a pharmaceutical company in Hong Kong, he started his PhD at UQ in early-2015 focusing on the processing and characterisation of high performance bioderived and biodegradable polyhydroxyalkanoates (PHAs)-based wood plastic composites. His primary research interests are in the area of biodegradable polymers, composite materials and sustainable engineering.

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Notes:

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Secondary structure-driven self-assembly of reactive polypept(o)ides: Controlling size, shape und function of core-crosslinked nanostructures

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The rational development of nano-sized delivery systems remains a challenge in the materials as well as bio-medical sciences, especially when independent control over size, shape and functionality of the carrier is desired. Herein, we report on nanostructures derived from amphiphilic block copolypept(o)ides, based entirely on endogenous amino acids. Controlled self-assembly allows for a strategy to adjust core polarity separately from particle preparation in a bio-reversible fashion. Additionally, the peptide-inherent process of secondary structure-directed self-assembly allows for morphology control of core cross-linked nanostructures from the same polymer precursor, offering a simple yet powerful approach to versatile peptide-based nanoparticles for delivery of various therapeutic relevant agens such as chemotherapeutic drugs or siRNA. A recently developed S-ethylsulfonyl protective group enables controlled polymerization of α-amino acid N-carboxyanhydrides (NCAs), directs self-assemblyin water and allows core-crosslinking by a fast chemoselective reaction into bio-reversible disulfides. The hydrophobic block is further able to form β-sheets,leading to unidirectional aggregation in aqueous solution and ultimately to worm-like particles, or, after suppression of secondary structures, to spherical micelles. Independent from the morphology, the crosslinker dictates the functionality of the nanoparticle core and enables the introduction of cationic moieties for siRNA complexation. Given the bioreversible nature of disulfide bonds, they respond to differences in reduction potential and hence provide stability in extracellular medium, while they are cleaved inside the cell and release the cargo.

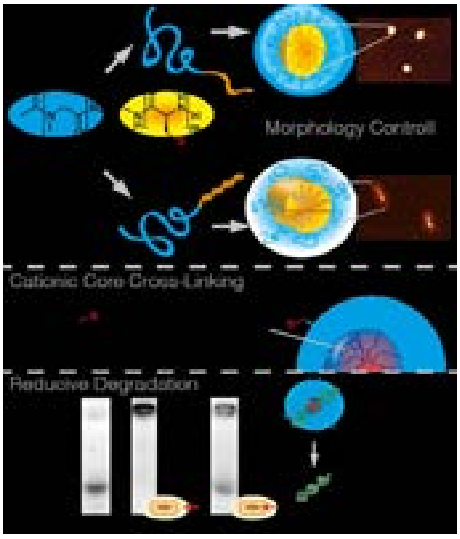

Figure 1: Self-assembly of amphiphilic PSar-b-PCys(SO_2Et) block copolypept(o)ides yields spherical or rod-like nanoparticles, depending on the secondary structure of the polymer. After self assembly the core functionality is introduced by disulfide core-crosslinking, which proves to be bioreversible.

Biography

Olga Schäfer studied Biomedical Chemistry at the Johannes Gutenberg University Mainz and obtained her graduate degree in 2014. After her Diploma thesis on Sethylthiosulfonyl- L-cysteine in peptide synthesis she started her PhD on the implementation of reactive block copolypept(o)ides for biomedical applications in the junior research group of Matthias Barz. The developed multifunctional polymers are applied in the shape controlled self-assembly of cross-linked nanostructures for delivery of therapeutic cargos such as chemotherapeutic drugs and nucleic acids.

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Bhavya Singhi et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Developing a low temperature spinning process for polyhydroxyalkanoates

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Polyhydroxyalkanoates (PHAs), known as bacterial polyesters, are considered novel polymers because of their biodegradability. A wide range of hydroxyalkanoate units, such as butyrates and valerates, are produced by bacterial synthesis. These units can be polymerized and copolymerized with varying mechanical and structural properties. Due to their biocompatibility, PHAs have been introduced in the fabrication of medical products, such as sutures and wound dressings. Some studies have explored the use of bacterial polyester for controlled release applications with thermally sensitive chemicals and drugs. Since PHAs are melt spun at temperatures as high as 200 °C, this requires a post spinning stage for chemical and drug incorporation. Hence, there is a need for low temperature spinning of bacterial polyester to prevent drawbacks of post-spinning drug incorporation, such as a non-uniform absorption that leads to an uneven release profile. To achieve this goal, we analyzed PHA solubility properties to develop a spinning process at low temperature. Next we compared dissolution of poly(3-hydroxybutyrate-4-hydroxybutyrate) (P34HB) in multiple solvents such as tetrahydrofuran, dioxane, methylene dichloride, and chloroform. This solvent study found methylene dichloride as the most suitable solvent. As a result, polymer solutions of various concentrations were coagulated and regenerated as polymer films in methanol at different temperatures to determine the optimal coagulating conditions. The polymer films were tested for their thermal properties, molecular weight distribution and degradation profile. It was determined that the process used didn't incur any significant degradation in the polymer. Currently we are working on translating this process of making bacterial polyester polymer films at low temperature to produce continuous filaments at low temperature. The project would further involve testing the process by incorporation of drugs during spinning and determining a release profile for those drugs. This study would help in developing a single step process for drug incorporation during fiber spinning, which can be utilized for drug delivery applications.

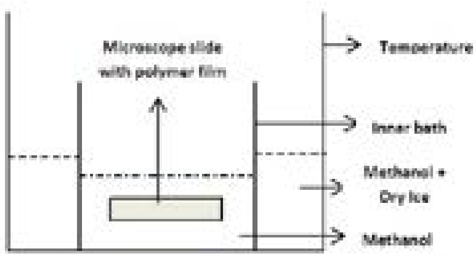

Figure 1. Schematic diagram of P34HB Polymer Film Coagulation

Biography

Bhavya Singhi is pursuing a PhD program in Fiber and Polymer Science at North Carolina State University, Raleigh. She graduated in 2016 with a master's degree in Textile Chemistry from NC State. Her undergrad degree was in Fibers and Textile Processing Technology from the Institute of Chemical Technology, Mumbai, India. She has worked on various projects involving polymer technologies such as encapsulation, extrusion and synthesis. Her research interests include polymer degradation, biopolymers and non-woven fabrics. She enjoys travelling, cooking and exploring new cuisines.

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Production of PHB (Poly-ß-hydroxybutyrate) based biodegradable plastics from algae

Rebecca Robert and **Priya R Iyer**
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Statement of the Problem: The current emphasis on sustainability, eco-efficiency and green chemistry has led to intensive search for renewable and environmentally friendly resources. Recycling plastic is an option, and works well for bottles, but it can cost more in energy terms than using virgin plastic. Burning waste plastic to harness the energy is another option, but the gases released by some plastics are very toxic. Several plastics masquerade as biodegradable, but breakdown into tiny invisible bits that could affect the soil and animals such as earthworms. One plastic, that's biodegradable and contains no nasty residues, is called PHBpolyhydroxybutyrate. PHBs are microbial polyesters, synthesized by numerous microorganisms having dual function as a reserve compound and as a stress metabolite accumulating in response to stress condition. In this present study, Algae are used for the production of PHB. Industrial utilization of algae as PHB producers has the advantage of converting waste carbon-dioxide, a greenhouse gas to environmental friendly plastics using the energy of sunlight.

The purpose of this study: It aims at the production of bio-degradable polymers at low cost. The substrates that are used for the production are very expensive; hence the use of inexpensive substrates can enhance the production of PHB which is used as a bio-degradable polymer in the manufacture of biodegradable plastic. The various inexpensive substrates that are used for the production of PHB includes Milk Whey and Dairy wastewater; Soy molasses; Bermuda grass; Jamul seed; Peel of oranges; Rice grain spent wash; Sago water, Fish meal water, etc.

Methodology and theoretical orientation :
1. Isolation and screening of new algae capable of utilizing specific carbon substrates and synthesizing novel PHB.
2. Standardization of PHB.
3. Identification of structure of PHB
4. Standardization of conditions for the production of PHB.
5. PHB production was also carried out using different carbon substrates like Glucose, Fructose etc.
6. Production of PHB using Inexpensive substrates - Soy molasses, sago water, Jamun Seed, Arrowroot powder, peel of oranges, milk whey and Dairy wastewater.

Findings:
1. The organisms producing PHB are isolated and its growth conditions are standardized.
2. Parameters for the production of PHB by the isolated organism are optimized.
3. Mass production of the biopolymer PHB with the standardized condition is optimized.
4. Mass production of PHB using various inexpensive substrates is optimized.
5. Selection of inexpensive carbon sources for the production of PHB. If the production cost is low, then the manufacture of biodegradable plastic bags, shopping bags and other applications will become feasible for the manufacturers.

Conclusion & Significance: Algae based bioplastics can play a vital role as an environment friendly and biodegradable alternative compared to conventional plastics. However, it is very clear that our view should be green environment to uphold our future generation to be free from plastic pollution, where the PHB producing algae contributions are going to be phenomenal. The major factor limiting the commercial use of PHB is cost of its production. The two significant areas increasing the production cost are the substrates used for the polymer production and downstream process. The use of inexpensive carbon sources would bring down the polymer cost. The advantages of biodegradable plastics are significant and of great importance for the future of the planet. Plastics are new to society - just a generation ago and plastic consumption was a tenth of what it is now.

Biography

Rebecca Robert is a research scholar working in the field of plastic biodegrdation. She has already worked on production of PHB by bacteria in her postgraduate studies and published papers on it. There is room for growth and expansion in many areas of the biodegradable plastic industry.

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Day 2

Joseph Greene, J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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A Review of biodegradation of biodegradable plastics under industrial compost, marine, soil, and anaerobic digestion

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Biodegradation was measured for biodegradable, compostable, and oxodegradable plastics while exposed to aerobic composting, soil, marine, and anaerobic digestion environments. Biodegradable plastics included, corn-starch based biobag, PHA bag, Ecoflex bag, and PLA lids. Positive and negative controls included, Kraft paper and polyethylene. Other plastics included, and oxodegradable plastic bags. For industrial composting environment, compostable plastic products, along with oxodegradable, cellulose paper, Kraft paper, and polyethylene plastic wrap, were placed in an environment consistent with ASTM 5338 conditions. For marine environment, the plastic samples were placed in a test environment consistent with ASTM 6691. For anaerobic digestion, plastic samples were placed in an environment consistent with ASTM 5511. For soil burial environment, plastic samples were placed in an environment consistent with EN 13432.The degradation was evaluated by measuring CO_2 gas, which evolves from the degrading plastic samples. For industrial compost conditions, the compostable plastics, namely, PLA, sugar cane, PHA, Ecoflex, and starched-based biobag, degraded at least 90% and met the degradation time requirement in the ASTM D-6400 standard. Theoxodegradable, UV-degradable plastics, and LDPE plastic bag had negligible degradation. After 180 days placed in a commercial food-waste composting operation, PLA, PHA, Ecoflex, and corn starch plastics completely degraded. Small fragments of sugar cane lids and Kraft paper were visible. The oxo-biodegradable plastic bags, LDPE plastic bags and UV-degradable plastic bag did not fragment nor degrade. The samples were also exposed to a simulated marine environment. Under marine conditions, PHA experienced significant biodegradation. Alternatively, corn-starch based trash bag, PLA cup, Ecoflex bag, sugar cane lids, UV-degradable plastic ring, and Kraft paper did not exhibit biodegradation under marine conditions. Under anaerobic conditions PHA experienced biodegradation, but PLA, paper, and polyethylene did not. Under soil burial conditions, PHA and starch based plastics exhibited some biodegradation, but PLA and polyethylene did not.

Biography

Dr. Joe Greene is a professor and department chair in the Mechanical and Mechatronic Engineering and Sustainable Manufacturing Department at California State University, Chico. He received a Ph.D. in Chemical Engineering in 1993 from the University of Michigan. Joe began teaching at California State University, Chico in 1998 after a 14-year career with General Motors Corporation in Detroit, Michigan. His research interests include biobased and biodegradable polymers, recycled plastics, composting technology, and anaerobic digestion.

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Notes:

Carbohydrate biopolymers associated with the South African sugar industry

Heidi du Clou and **Stephen N. Walford**
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Statement of the Problem: Polysaccharides are carbohydrate biopolymers that are derived from numerous sources; including plants and microorganisms. They are present in sugarcane and in sugarcane processing streams. Sugarcane polysaccharides include starch, dextran, indigenous sugarcane polysaccharide, Robert's glucan, galactomannan, levans and sarkaran. Collectively, sugar technologists refer to mixtures of polysaccharides found in processing streams as "gums". Gums are regarded negatively in the sugar industry. Not only do they represent a direct loss of recoverable sucrose (sugar) due to the action of the microbes that produced them, but they also possess physical properties that affect processing. For example, cane starch, dextran and sarkaran have been linked to increased viscosities and related sucrose losses in sugar processing streams. The causes, chemical make-up and effects of cane starch and dextran are well documented. However, other gum polysaccharides are not as well understood. This research looks to establish the methods to isolate, elucidate and characterise the major constituents of gums in the South African sugar industry. Methodology & Theoretical Orientation: Gums from various sugar processing streams from across South Africa were isolated and characterised by methods that were established using gel filtration chromatography, gas chromatography mass spectroscopy, nuclear magnetic resonance spectroscopy, rheology and enzymatic hydrolysis followed by high performance liquid chromatography. Findings: Polysaccharides that constitute gums in the South African sugarcane industry are not limited to starch and dextran, but rather a complex and variable mixture of biopolymers. Conclusion & Significance: The techniques developed and knowledge gained better equips the sugar industry to analyse gums and opens opportunities for the industry to exploit the unique physico-chemical properties of these biopolymers.

Biography

Heidi du Clou has her expertise in analytical chemistry, chemical method development and biopolymer structure elucidation. She is passionate about biopolymers, mass spectroscopy and rheology. Heidi has been involved in the sugarcane industry since 2009. Her research for this industry has led to the development of several methods that enable the analysis of biopolymers within complex sugar matrices, and the compilation of a carbohydrate mass spectral library specific to the polysaccharides found in the industry. Her passion for rheology has led to an improved understanding of sugarcane-derived biopolymer solution behaviour, which has initiated a multitude of new research possibilities for the sugarcane processing industry.

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Andrea Arias et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Polyethylene Furanoate: A promising biobased polyester for barrier applications

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[3] Plastipak Europe, Belgium

Poly(ethylene furanoate) – PEF has gained extensive attention in recent years due to its high barrier properties to oxygen and carbon dioxide. PEF is a biobased polyester polymerized through combination of 2,5-furandicarboxylic acid – FDCA and ethylene glycol. Many authors consider PEF a potential replacement to PET and the next generation of FDCA biobased polyesters. The successful introduction of PEF in the beverage and food packaging industry requires bringing concrete proof of its applicability and versatility as a barrier layer, combining the fundamental understanding of the unique properties of PEF with the more practical aspects of the tailored application development. The clarity and mechanical performance of PET have placed it as the material of choice for manufacturing of packaging for carbonated soft drinks (CSD) juices and water. Multilayer packaging has been developed under the principle to sandwich a high barrier material between PET layers in order to improve its undesirable low barrier to CO_2 and O_2 – often a limitation of PET containers. In this talk the barrier enhancement properties of multilayer bottles using PEF as an intermediate layer embedded in a PET CSD bottle will be presented. The manufacturing of preforms and bottles was accomplished using two-stage injection stretch blow molding –ISBM. The weight percentage range of PEF in the bottle preform was defined at 3, 5, 10 and 15wt% and PET monolayer was used as a reference. The CO_2 permeation of multilayer PET/PEF bottles was studied over time under standard conditions, i.e. 22°C and 50% RH. Table 1 shows the barrier improvement factor for each multilayer composition, which is calculated as the ratio between the loss percentage per day using the monolayer PET as a reference. At the highest PEF wt.% studied, i.e. 15wt%, the PEF medium layer contributes to CO_2 loss twice slower than PET monolayer bottles. For the same concentration, the barrier to O_2 is improved by 70%, as it is depicted in Table 2. In addition to CO_2 and O_2 barrier performance, the relevant aspects to the processing of PEF in typical pilot facilities involving the flow viscosity properties, temperature processing windows and melt stability will be discussed a

Table 1 – Carbon dioxide barrier improvement factors of multilayer PET/PEF bottles

Bottle	CO_2 loss(%/day)	BIF
100% PET	0.223	1.00
3wt% PEF	0.175	1.27
5wt% PEF	0.147	1.54
10wt% PEF	0.125	1.80
15wt% PEF	0.107	2.08

Table 2 – Oxygen barrier improvement factors of multilayer PET/PEF bottles

Bottle	O_2 gain (ppm/day)	BIF
100% PET	0.052	1.00
3wt% PEF	0.044	1.19
5wt% PEF	0.040	1.30
10wt% PEF	0.035	1.46
15wt% PEF	0.031	1.68

Biography

Andrea Arias has built her expertise as a research engineer specialized in application development of biopolymers and biocomposites. She is experienced in combining the fundamental understanding of the unique properties of bioplastics with the more practical aspects of the tailored product development. She has a Bachelor degree in Chemical Engineering and she earned her Ph.D. degree in polymer science at Polytechnique School of Montreal when working with nanocellulose applications for PLA-based composites. Andrea currently works as Application Specialist in the Biobased Innovations business unit of Dutch company Corbion Purac. Corbion is the global market leader in lactic acid and lactic acid derivatives with over 80 years of fermentation experience. She's involved in the FDCA to PEF value chain within the company.

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Juliana S M Guedes et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Polymers and steam cells

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[2] FUMEC University, Brazil

The question of burials is considered sacred by different cultures, beliefs and religions. Cremation is an option less aggressive to the environment when compared to the conventional procedure, as it does not yield conventional residues and pathogenic microorganisms. However, this practice has been questioned and even condemned by some religions. Yet, the conventional burial system causes the contamination of the soil by the necroslurry; a viscous and polluting liquid, composed mainly of cadaverine; an amine ($C_5H_{14}N_2$) of repulsive odor. Its viscosity is due to internal chemical reactions, which produce polymers, which makes it difficult to be transported and removed from soil and groundwater. Again, cremation seems to be a feasible solution for the problem. Nevertheless, this procedure causes the loss of genetic cells. It hinders, for example, the definition of paternity and/or the treatment of diseases through the removal of stem cells from cadavers that, according to recent research, can be reactivated and transformed into any kind of cells or tissues of the body in good condition. A new technology for the vertical burial system which is currently being developed in Brazil, allows the gas exchange and controls humidity, pressure and temperature inside shrouds, causing an aerobic decomposition that eliminates environmental contaminations, reducing environmental impacts, diseases and odors. The sealed system demands theapplication of fiberglass plates and polymers, which are resistant, elastic, and suitable to absorb the coefficient of expansion of the system, preventing any leakage due to retraction. This method also allows the storage of genetic cells, proving to be a good solution for health problems as well as environmental, religious and cultural issues framing this matter.

Biography

Juliana da Silva e Mascarenhas Guedes holds a degree in Civil Engineering from Universidade Federal de Minas Gerais, a Master's Degree in Structural Engineering from Universidade Federal de Minas Gerais, a PhD in Earth Sciences from Universidade Fernando Pessoa, in Porto, Portugal. Currently, is a professor of Civil Engineering at Universidade FUMEC and post-graduate in Structural Engineering from Universidade FUMEC. She is an investigator at FP-ENAS, UFP Energy, Environment and Health Research Unit, Porto. Has experience in the structural and sanitary area. Articles in papers in sanitation, environmental and structural área.

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The matter of insects in cemeteries and the importance of necroslurry polymers

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The most well-known destinations for lifeless bodies, used and defended by beliefs, religions and people, are graves and burial chambers. They are the forms of burial, which, in the majority, bring comfort to the families and people close to the deceased, for idealizing that they are religiously and socially intact to beloved beings. However, a large part of the population is unaware or not informed about the environmental problems that such burials bring to public health and the environment. After the burial, the body begins to go through physical, chemical and microbial processes, along the natural sequence of decomposition performed by bacteria, as well as by animals and insects. Pathologies, coming from the construction method used in cemeteries, such as cracks in the concrete and masonry, allow these animals and insects to go into the coffins and take part of the decomposition process. Consequently, they become potential transmitters of diseases. It is important to emphasize that this gathering of animals in the cemeteries causes great discomfort to visitors and annoyance to near by dwellers. Necroslurry is a liquid resulting from the decomposition of corpses, which has a sound capacity to percolate soils and groundwater and therefore, contaminate both, soil and groundwater near the cemeteries, due to the presence of pathogenic microorganisms in its composition. The vulnerability of soils and aquifers, which can be classified as low, medium or high depending on where the burial occurred, medium or high permeability of the cemetery soil and the position either above or below ground level are some of the factors that Influence the way necroslurry may reach soils and groundwater. These impacts can cause disease and epidemics, as many cities use such groundwater as their water source and the soil is used produce food crop. . Necroslurry is a greyish and brownish solution, mainly composed of cadaverine, an amine ($C_5H_{14}N_2$) with a repulsive and nauseating odor, a putrefaction by-product, besides being formed by water, minerals and organic degradable substances, the medium density is equal to 1.23g / cm³, pH between 5 and 9, at 23 to 28 °C, in its liquid state is more viscous than water, due to its polymerization and the chemical reactions that produce the polymers. Due to the fact that it is a polymerizable substance, the transportation of necroslurry in its liquid phase is aggravated. The ideal is to use a system that transforms the liquid necroslurry into gas, using burial and constructive methods proper for this phase, facilitating the transportation as well as preventing the contamination to the environment. This article will show how these polymers hamper the attempts to prevent the contamination. It will also show what happens to the polymers resulting from the chemical processes of decomposition of the human body, when they reach the soil and the groundwater. Nowadays, There are, in Brazil, technologies that fulfill these needs, monitoring the treatment of gases by molecular dissociation and avoiding the polymerization. Some Brazilian cities have already been using modular structures made of carbon steel and materials, which are submitted to a leak test, so as to ensure that the passage of gases and liquids are stopped, creating, in such a way a great sealing capacity. This method is very effective and causes low environmental impact, eliminating the difficulties of the necroslurry treatment and fully complying with CONAMA Resolution 335/2003.

Biography

Camila Alda Farhat Magalhães Souza holds a degree in Psychology at *Universidade FUMEC*. Specialist in Afro-Brazilian History and Culture from *UNIANDRADE*, 2nd Lieutenant of the Brazilian Air Force, Psychologist. Currently, works as a clinical psychologist, researcher and literary reviewer.

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Luciana N Magalhães et al., J Bioremediat Biodegrad 2017, 8:6 (Suppl)
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Vertical concrete slab with polymer polyethylenotereal (PET) reinforcement

Luciana N Magalhães[1], **Juliana S. M. Guedes**[2], **Marina S. Godinho**[3], **Thaís Rubião Pimenta**[3], and **Maria Alzira P. Dinis**[2]
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Recycling polymers is a very valued act because of its enormity of waste. Its reuse is ideal in long-life applications such as paving, plastic wood, civil construction, plasticulture, automobile industry and electro-electronics, etc. The process of recycling this material can be mechanical, physical, chemical or even energetic.

Most of the current vertical cemeteries are built in concrete, which is a very serious fault, since conventional concrete does not have the structure to withstand the residues generated by the human bodies' decomposition, causing leakage through the cracks that appear in the slabs of the loci.

A sustainable solution to such a complication may be a substitution of this material with recyclable materials, which are usually disposed of in the environment. The recycled polymer from PET is an excellent option because it presents important characteristics such as low water absorption, resistance from aging and because it is innocuous, which means that it does not constitute a substrate for the proliferation of microorganisms.

A concrete impregnated with polymers would translate in a reduction of porosity and permeability.

Therefore, the objective of this article is to evaluate the efficiency of alternative techniques with the use of polymers in concrete structures in aggressive environments or even new structures based on recycled polymers. There is also the case study in vertical slab of locules, in addition to performance and comparative in the aspect of flexibility and fence.

In conclusion, we will have an analysis of the advantages and shortcomings of the insertion of the organic polymer into the mixture of conventional concrete or structures made of polymers and other sustainable materials. In addition, the presentation of proposals of solution with the conditions that the structure is submitted to.

Figure1: Symbology used to identify polymer packages. Standard NBR 13.230 of ABNT (Brazilian Association of Technical Standards)

Biography

Luciana Nunes de Magalhães holds a degree in Civil Engineering from Universidade FUMEC, a master's degree and a PhD in Structural Engineering from Universidade Federal de Minas Gerais. Currently, is a professor at Pontifícia Universidade Católica de Minas Gerais and provides updated courses for engineers and architects in the construction / structural systems area at CREA MG. Has professional experience in the Structural Engineering field, besides publications in magazines and congresses, with emphasis on those systemsr.

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