The Nonwovens Institute

Research Focus Groups

Seed Proposals

List of Proposal Titles

- Energy and resource reduction during manufacturing
- Focus on Recycling and designing for recycling
- Focus on Material Properties
- Overview of Disposal Systems for Nonwoven Materials
- Nonwoven Process Digital Twins – Hybrid Physics/ML Models
- AI-Based Material Quality Modeling and Simulation
- Scalable NW Failure Modeling using Graph Networks
- Structure-Property-Performance Models of Polymers using Graph Networks
- NW Failure Modeling using AI and FEM
- Mechanical Modeling of Hydrogels
- Mechanical Modeling of Swelling Fibers
- Modeling Bicomponent Fiber Extrusion
- Macroscopic Modelling

- Melt Electro Spinning For Membrane Replacement
- Improve Meltblowing Air Flow To Reduce Roping
- Inline Nonwoven Testing
- Striation Effect on Fiber Properties
- Specific Energy Consumption
- Screen Changer - Breaker Plate Design
- Recycle Effect on Fiber Properties
- Process/Equipment Considerations for Bio-resin Extrusion
- Mixing of Additives in Nonwoven Extrusion
- Evaluate Use of Additive Manufacturing in the Nonwovens Extrusion Process
- Behaviors of Bio-Based Polymers
- Composites with Cellulosic Fibers
- Characterization of Experimental Polymers
- Effect of Finishes & Coatings on Biodegradability of Bio-Polymer Substrates
- Effect of Finishes & Coatings on Biodegradability of Cellulosic Substrates
- Recycling Bicomponent Fibers
- Smart Nonwovens

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Sustainability

Research Focus Groups

Seed Proposals

Background

Each research proposal should align with at least one of the RFPs described in this document and must clearly indicate how the proposed idea will contribute to a reduction in the environmental footprint of nonwovens. Both manufacturing and end of life management should be considered. There are many ways in which the environmental footprint of a material may be reduced including, for example:

- reduction in the consumption of energy, water or another scare resource during the manufacturing phase
- improvement of the recyclability of a material coupled with information to show that recycling reduces a measurable environmental load (e.g., energy consumption, water pollution)

A proposal to develop a degradable material, without justifying why biodegradability is a desirable attribute, will not be sufficient. In contrast, the development of a material that degrades under conditions present in the freshwater or marine environment would be useful for a material that is known to release microplastics during its use.

Under this overarching theme, a number of ideas were developed, and they were grouped into categories as follows

Energy and resource reduction during manufacturing

Research Topic ID#

2021-RT-01

Focus Group Thrust

Sustainability

Comments

Problem

NWI is interested in proposals for materials and/or processes that reduce energy and/or resource consumption and deliver equivalent properties and performance of the nonwoven. Proposals that improve end-of-life management alternatives for a material will also be considered.

Expected Outcome

Development of a modified material or modified manufacturing process that reduces energy and/or resource consumption or increases recyclability

Example Problems

- Reversible Dyeing or Printing
- Advanced/chemical recycling to virgin polymers (upcycling)
- Reduce waste by designing a system to make it easier to reuse PP and PE manufacturing waste
- Reduce energy use and water consumption during manufacturing

Focus on Recycling and designing for recycling

Research Topic ID#

2021-RT-02

Focus Group Thrust

Sustainability

Comments

Problem

NWI is interested in receiving ideas directed towards designing for recycling/recyclability. This could include the design of new materials or improved identification or processes to facilitate sorting of existing materials.

Expected Outcome

A material that is either easier to recycle or easier to separate for recycling

Example Problems

- Design for improved or simplified mechanical or chemical recycling
- Ease of separation of components into fibers to maximize recyclability
- Traceability/identification of nonwovens

Focus on Material Properties

Research Topic ID#

2021-RT-03

Focus Group Thrust

Sustainability

Comments

Problem

NWI is interested in receiving ideas regarding materials designed for sustainability including but not limited to bio-based or bio-sourced raw materials (e.g., polymers, fibers), biodegradable materials, marine biodegradable materials

Expected Outcome

A material with properties that contributes to an improved environmental footprint (e.g., longer life, marine degradability for some products). The proposal must make the case for why the material property is desirable. Proposals for anaerobically degradable products that are likely to be sent to a landfill at the end of life are discouraged.

Example Problems

- Develop materials that reduce/minimize CO_2 release during manufacturing and end of life management
- Develop materials that biodegrade in the marine environment when present as a microplastic.
- Develop aerobically degradable materials that are likely to become litter or are easily separable in locations where composting is a viable option

Overview of Disposal Systems for Nonwoven Materials

Research Topic ID#

2021-RT-04

Focus Group Thrust

Sustainability

Comments

Problem

The industry does not have a good understanding of the waste management systems into which nonwovens go at the end of life. The disposal system varies by country so there is not a single description of a disposal system that is uniformly accurate.

Expected Outcome

A description of the waste management infrastructure in the countries that represent major markets for nonwovens (countries to be specified by NWI). This should include a description of the solid waste management infrastructure and applicable regulations in each country. The waste management infrastructure should include the availability of collection for waste that is to be recycled, treated (thermal, biological) or disposed. Comments about future infrastructure should also be included.

Example Problems

Modeling

Research Focus Group

Seed Proposals

Modeling Research Focus Group

Nonwoven Process Digital Twins – Hybrid Physics/ML Models

Research Topic ID#

2021-RT-05

Focus Group Thrust

Modeling

Comments

For details, contact:
Rajeev Chhabra

Problem

One of the challenges in industrial research and development is cycle time in experimenting with materials on a commercial or high speed pilot scale. Until a material or product is tested at the scale of production, it may not be viable for commercial use. And to run commercial scale experiments, it gets very expensive. If the experiments are not run at scale, the risk of failure is very high. Materials that behave nominally in lab environment can behave totally differently at high speeds and length scales. For example, in fiber spinning, flow or strain induced crystallization is very different at 2500 m/min vs 5500 m/min for PET. So, there is a need for digital simulations that match up with scaled experiments.

Expected Outcome

Create material transformation digital twins of nonwoven manufacturing, converting, and testing including ability to change geometry and process settings on the fly. This could use a combination of first-principles computational physics models and machine learning (or even deep learning). The problem focus could start with spunmelt processes, followed by carded and hydroentangling. Concurrently, the same could be done for converting processes such as calendaring, cutting, folding, etc.

Example Problems

Ability to run in silico experiments (simulations) on digital twins of processes. Conduct What-if scenarios including but not limited to material failures, quality, and risk estimations.

Modeling Research Focus Group

AI-Based Material Quality Modeling and Simulation

Research Topic ID#

2021-RT-06

Focus Group Thrust

Modeling

Comments

For details, contact:
Rajeev Chhabra

Problem

Estimating nonwoven material or product softness, evenness, drape, opacity, and in general, human perceived quality has been a challenge for many decades. Multiple models using bottom-up approach (estimating quality from mechanical or refractive properties) and even top-down approach (artificial neural networks with supervised learning) have not been successful. The need for a ”general-class” model continues to exist in the industry. With the advent of explainable AI, the time is ripe for a general class model that can incorporate or combine both bottom-up and top down approaches.

Expected Outcome

Model and Simulate nonwoven material quality using Explainable AI that combines human factors with mechanistic properties of material. Simulation may involve the use of Generative Adversarial Networks similar to those used in Deep Fake technology. Problem can start with modeling human perception of softness followed by other quality metrics.

Example Problems

Ability to evaluate quality of nonwoven material (and product therefrom) in a “human-like” fashion or better. Generate an improved product image/video/sound using an explainable simulation (not just pretty pictures) which can be used to improve the real product.

Modeling Research Focus Group

Scalable NW Failure Modeling using Graph Networks

Research Topic ID#

2021-RT-07

Focus Group Thrust

Modeling

Comments

Rajeev Chhabra

Problem

Nonwoven material failure and fractures have been modeled with a limited success. With the advent of new class of network models using graphs - graph neural networks - it is now possible to predict failures. Such networks are amenable to scale and speed (strain and strain-rates) required of commercial processing as well as in-use conditions.

Expected Outcome

Model and Simulate nonwoven material failures at scale using graph networks

Example Problems

Failure and risk prediction, ability to compare material structures, recommend changes for improvements

Modeling Research Focus Group

Structure-Property-Performance Models of Polymers using Graph Networks

Research Topic ID#

2021-RT-08

Focus Group Thrust

Modeling

Comments

For details, contact:
Rajeev Chhabra

Problem

Polymer crystal structures have been modeled with a limited success. With the advent of new class of network models using graphs - graph neural networks - it is now possible to predict polymer properties. Such networks are amenable to scale and speed (strain and strain-rates) required of commercial processing as well as in-use conditions.

Expected Outcome

Model and Simulate polymer structures using graph networks

Example Problems

Structure property relationships, ability to compare polymer behaviors and structures, recommend changes for improvements

Modeling Research Focus Group

NW Failure Modeling using AI and FEM

Research Topic ID#

2021-RT-09

Focus Group Thrust

Modeling

Comments

For details, contact:
Rajeev Chhabra

Problem

Fracture propagation in nonwovens and nonwoven-based laminates has been a challenging problem because continuum mechanics models cannot be directly applied to the macro-structure. At fiber level, continuum mechanics models can be applied using Finite Element Modeling. However, the scale of modeling and constitutive material models are still limited. However, combination of continuum mechanics and LSTM (long-short term memory model) is a new avenue advanced by Los Alamos National labs to predict failures and fracture propagation, such as tears.

Wang, Yinan, Diane Oyen, Weihong Grace Guo, Anishi Mehta, Cory Braker Scott, Nishant Panda, M. Giselle Fernández-Godino, Gowri Srinivasan, and Xiaowei Yue. "StressNet-Deep learning to predict stress with fracture propagation in brittle materials." *npj Materials Degradation* 5, no. 1 (2021): 1-10.

Problem

Model and Simulate nonwoven material failures using a hybrid of FEM and Deep Learning

Example Problems

Propagation of fractures in nonwovens and nonwoven laminates, recommend changes for improvements

Modeling Research Focus Group

Mechanical Modeling of Hydrogels

Research Topic ID#

2021-RT-10

Focus Group Thrust

Modeling

Comments

For details, contact:
Hooman Tafreshi

Problem

Hydrogels continue to play a significant role in nonwoven products used in different applications. An example of commonly used hydrogels in nonwoven products is the Super Absorbent Polymers (SAP) used in diapers and incontinence materials. SAP is often added to a diaper in the form of a dry powder that swells and grows when the diaper becomes wet.

Expected Outcome

Efficient design and manufacture of nonwoven products that contain hydrogels require quantitative understanding of how hydrogels behave under mechanical loads (e.g., tensile, compressive, or torsion). This behavior is also dependent on the amount of moisture inside the hydrogel. In this concern, there is great interest in developing a fluid-solid microscale model that can simulate mechanical properties of hydrogels and hydrogel-fiber assemblies at different moisture saturation.

Example Problems

1-Quantitative understanding of hydrogels' micro- and nano-structures at different moisture saturation.
2-The ability to predict the behavior of hydrogels and hydrogel-fiber 3-D networks under tensile and compressive forces.

Modeling Research Focus Group

Mechanical Modeling of Swelling Fibers

Research Topic ID#

2021-RT-11

Focus Group Thrust

Modeling

Comments

For details, contact:
Hooman Tafreshi

Problem

Variety of nonwoven products (e.g., wipes) are comprised of moisture-absorbing fibers (e.g., rayon…). Such fibers swell in the presence of moisture, and this results in dramatic changes in their mechanical properties.

Expected Outcome

Currently, there exists no practical method of predicting mechanical properties (e.g., stress-strain behavior, bending rigidity…) of moisture-absorbing fibers. Therefore, there is great interest in models that can predict mechanical properties of swelling synthetic and/or natural fibers under dry and wet conditions.

Example Problems

The ability to quantify the mechanical properties of swelling fibers under different wetting saturations.

Modeling Research Focus Group

Modeling Bicomponent Fiber Extrusion

Research Topic ID#

2021-RT-12

Focus Group Thrust

Modeling

Comments

For details, contact:
Hooman Tafreshi

Problem

Bicomponent fibers provide numerous attributes to a nonwoven material. For instance, they can be fibrillated to produce smaller fibers for filtration applications or to create a stronger (better entangled) but softer wipe.

Expected Outcome

Despite their importance to the nonwoven industry, bicomponent fiber production has remained an empirical art. In this concern, there is great interest in developing 3-D models that can simulate formation of bicomponent fibers in processes such as spun-bonding and/or melt-blowing. Of particular interest here is the solidification of the two polymers next to one another and the bonding between them at their interface.

Example Problems

Quantitative understanding of the die-swell and the interfacial bonding between the two polymers in a bicomponent fiber as a function of spinning parameters and polymer properties.

Modelling Research Focus Group

Macroscopic Modelling

Research Topic ID#

2021-RT-13

Focus Group Thrust

Modelling RFG

Comments

For details, contact:
Carl J. Wust

Problem

Macro-modelling is often limited by the number of nodes being considered. Work on understanding what happens at the node level – for example at a bond spot, in a single hydroentangled point, etc. – is extrapolated to the structure. Unfortunately, the number of interactive "nodes" in a real fabric is daunting. For example, in a calender bonded structure, there are 372 spots per square inch and tens of thousand of individual fibers. The extrapolations fail.

Expected Outcome

It is not simply a matter of creating more nodes. There needs to be a new way of thinking to properly model on a macro-scale. There may need to be scale-able nodes where we understand a node, model the interactions among tens or hundreds, then model the interactions among these larger groups. The true challenge is to create these understandings pushing the limits of modelling.

Example Problems

The expected outcome is a true understanding of what is happening in the real world with a predictive model of what will happen, not a model attempting to explain what has happened. The consolidation method will need to be limited so there are opportunities for different approaches.

Engineered Structures

Research Focus Group

Seed Proposals

Melt Electro Spinning For Membrane Replacement

Research Topic ID#

2021-RT-14

Focus Group Thrust

Engineered Structure

Comments

Background

Using e-Spinning, it is possible to reach pore sizes equivalent to membranes used in liquid filtration, notably in the pharmaceutical industry. The issue is contamination by left over solvent. A melt-based system would bypass this issue.

Problem

- Modify a meltblowing system to use high voltage or modify an electrospinning system to use melt
- Establish meltflow/molecular weight distribution requirements
- Establish structure-process-property relationships

Expected Outcome

- A lab scale device
- Polymer requirements for processing
- Basic understanding of process parameters

Improve Meltblowing Air Flow To Reduce Roping

Research Topic ID#

2021-RT-15

Focus Group Thrust

Engineered Structure

Comments

Background

Based on a previous study at NWI (17-216NC), it appears that a limitation of high density Meltblown dies is excessive roping. While it might not affect the mean pore size, it does impact the hydrostatic head which is critical in barrier applications.

Problem

- Study the air flow in the Meltblown process with the aim of stabilizing filament trajectory

Expected Outcome

- Die design with less roping

Inline Nonwoven Testing

Research Topic ID#

2021-RT-16

Focus Group Thrust

Engineered Structure

Comments

Background

Modern Nonwoven production lines monitor closely their status but often are limited in monitoring the product they make.

Problem

- Evaluate existing monitoring equipment and identify gaps
- Select one gap and design an inline testing equipment and protocol

Expected Outcome

- Report on existing inline testing equipment

The Nonwovens Institute

Extrusion

Research Focus Group

Seed Proposals

Extrusion Research Focus Group

Striation Effect on Fiber Properties

Research Topic ID#

2021-RT-17

Focus Group Thrust

Extrusion

Comments

Background

Mixing process requires additive granulates to reduce size mix with the matrix and create homogeneous material after extrusion. Mixing process start with striation of additives to reach a size that allow proper distributive mixing. Striation depends on shear strain created by screw speed. Color, softness, and other properties in the nonwoven depends on how good the additive mix with the matrix. It is important to now if there are correlations between striation and fiber properties.

Problem

Market trend for spunbond nonwovens is to reduce basis weights (BW) of nonwoven fabrics. Low BW require extreme low productivities and high spinbelt speeds. It means, screw speed of extruder has to be run at low speeds decreasing shear rates. Such reduction affect mixing process inside the extruder. There is a need to know the minimum shear strain when running the must common additives in spunbond nonwovens like white color, softness and antistatics.

Expected Outcome

Define minimum striation required for three different additives (used in spunbond nonwovens) for effective mixing and study its effect on fiber properties.

Extrusion Research Focus Group
Striation Effect on Fiber Properties cont.

Research Topic ID#

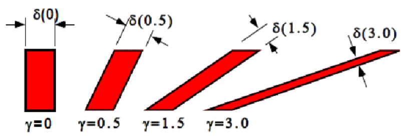
2021-RT-17

Focus Group Thrust

Extrusion

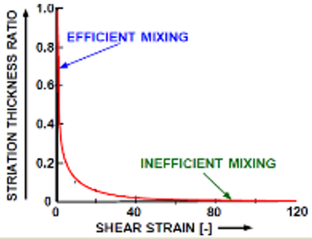
Comments

Background



Striation thickness as a function of the shear strain

$$\delta/\delta_0=[1+\gamma^2]^{-0.5}$$



Problem

Expected Outcome

Extrusion Research Focus Group

Specific Energy Consumption

Research Topic ID#

2021-RT-18

Focus Group Thrust

Extrusion

Comments

Background

The extruder function in nonwoven process is to melt, mix and pump polymer to pass through the die and create fibers. Melt temperature is important because it is one of the ways to control viscosity and polymer degradation. The amount of energy used to melt polymer in an extruder comes from shear rate (viscous heat) and heaters; as a rule of thumb in the industry, its ratio must be 80/20 but there is no scientific evidence to prove this hypothesis, neither to correlate it with fiber properties (tensile properties, crystallinity, etc).

Problem

Polymer degradation caused by excess of viscous heating or heat coming from heaters, generate extrusion performance instabilities like fiber breaks and fiber properties deterioration.

Expected Outcome

Evaluate effect of different energy ratios between viscous heating and heaters, on fiber properties (tensile properties and crystallinity).

Extrusion Research Focus Group
Specific Energy Consumption cont.

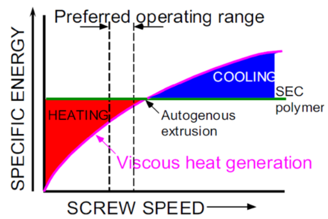
Research Topic ID#

2021-RT-18

Focus Group Thrust

Comments

Background



Problem

Expected Outcome

Extrusion Research Focus Group

Screen Changer - Breaker Plate Design

Research Topic ID#

2021-RT-19

Focus Group Thrust

Extrusion

Comments

Background

Physical properties variation is critical for many spunbond fabric applications. Its control depends on multiple factors and one of those is the variation across the machine width. Once polymer is melted and mixed with additives like color or, even recycle; it is pumped through the edges and homogeneity should be good to reduce variation across the width. Mixing can be improved through mixing elements in the extruder, screw speed, screw design, filtration media, breaker plate design in the screen changer and others.

Problem

Typical variation on tensile properties is between 7% and 10%. It affect fabric performance in processing machines like diapers and wipes. Excess in elongation can cause adhesives to get in touch rollers and cause machine downtimes. Some times, tensile properties cause sudden fabric breaks because of low tensile properties.

Need to run trials at the lab level using the stand alone extruder in the NWI lab and, get one used screen changer available in the market to be added to the extrusion process. Breaker plate changes must be the only variable and keeping the rest of the system (resin, temperatures, tput, die package, etc) the same.

Expected Outcome

Using extruder lab, evaluate effect of different breaker plates design (screen changer) on nonwoven tensile properties and its variation.

Extrusion Research Focus Group

Recycle Effect on Fiber Properties

Research Topic ID#

2021-RT-20

Focus Group Thrust

Extrusion

Comments

Background

Recycle consumption is a need since resin price is going up and because of the scrap / waste produced should be refed into the process at the same amount as it is produced. Repalletized pellet consumption depends on recycle characteristics, equipment condition and processing settings.

Problem

Lack of understanding of extrusion settings on recycle processing, cause scrap / waste increase due to fiber properties failing.

Expected Outcome

Understanding the effect of processing settings like extruder inlet temperature, melt temperature, extruder pressure and extruder speed on fiber properties like tensile properties and crystallinity.

Extrusion Research Focus Groups
Process/Equipment Considerations for Bio-resin Extrusion

Research Topic ID#

2021-RT-21

Focus Group Thrust

Extrusion Research Focus Group

Comments

Background

Most nonwovens lines are designed to PP while most bio-resins are polyester based. This potentially poses extrusion challenges and may need modifications in the equipment and extrusion conditions. For e.g. bio-resins such as PHA and PCL are low melting and need to be extrusion processed at conditions different than PP.

Problem

Investigate the equipment (throat cooling, off gassing), process (extrusion profile) and material (anti-oxidants, plasticizers) modifications needed to process bio-resins on nonwoven lines

Expected Outcome

Understanding of the limitations of existing nonwoven lines to process new bio-resins and provide recommendations towards equipment, formulation and extrusion process changes

Template for Research Focus Groups
Mixing of Additives in Nonwoven Extrusion

Research Topic ID#

2021-RT-22

Focus Group Thrust

Extrusion RFG

Comments

CW

Problem

Mixing of additives is a critical component of an extruder. Many different types and configurations of extruder screws, including bicomponent co- and counter-rotating screws have been designed to optimize the mixing of components including solids, meltable, and different viscosities. A good blend is critical for spinning uniformity and continuity. This is applicable to melt blown, spunbond, and filament (staple) spinning.

Expected Outcome

Single screw extruders with no mix section are notorious for poor mixing. Different screw configurations have been built to optimize mixing – such as the Maddock mixing screw among others. There are even specialty companies, for example Rauwendaal Extrusion Engineering, who will custom design screws for specific applications. However, the understanding of what and why is poorly understood in the industry being relegated to a few specialist. Additionally, poor mixing has plagued students who blame poor performance during programs on factors other than mixing.

Example Problems

This program could be a mix of experimental and modelling to develop a playbook for mixing of materials. Potentially either a masters or PhD program depending on the depth of study and the integration of modelling.

Evaluate Use of Additive Manufacturing in the Nonwovens Extrusion Process

Research Topic ID#

2021-RT-23

Focus Group Thrust

Extrusion Research Group

Comments

Background

Polypropylene resins have overwhelmingly been the main resin used in melt extrusion processes in the nonwoven industry. Global concerns with respect to environment sustainability is now a major driver in many industry groups and markets, including the nonwovens industry. To meet the expectation of this megatrend, new materials that meet sustainability criteria will have to be melt extruded to meet product development needs in the nonwoven industry. Equipment designs such as the extrusion screws and die may need modifications to meet the demands of new polymer resins. Evaluation of using additive manufacturing (3D-printing) technology to rapidly make extrusion screws and die prototypes to test new polymer resins for the nonwoven industry is of utmost importance.

Problem

Melt extrusion of new polymeric materials will be greatly enhanced with a flexible prototyping capability. Currently, such capability is lacking in the nonwoven industry. Additive manufacturing (3D-printing) may be platform that can be used to close this gap.

Expected Outcome

Develop process parameters and design criteria to enable rapid prototyping of extrusion dies.

Materials

Research Focus Group

Seed Proposals

Materials Research Focus Group

Behaviors of Bio-Based Polymers

Research Topic ID#

2021-RT-24

Focus Group Thrust

Materials RFG

Comments

MN

Problem

Behaviors of using different grades of PLA, PHS, PBS, other bio-based polymers in nonwovens and their functionalities. How do the physical properties compare to PP for example?

Expected Outcome

Not as much knowledge on these types of polymer systems and their behaviors in nonwovens.

Example Problems

Knowledge for industry for the future.

Materials Research Focus Group
Composites with Cellulosic Fibers

Research Topic ID#

2021-RT-25

Focus Group Thrust

Materials RFG

Comments

RS

Problem

Sustainability has been one of the key factors deciding the development direction of nonwoven industry. Biopolymer, e.g., cellulose naturally forms nanofibers, which have advantages over polyolefin and polyester in sanitary/food related applications. Blending of hydrophilic nanocellulose into polyolefin is challenging in combination of a fiber processing (filter-blocking) issue. In addition, the commercial wood-based cellulose fibers usually contain lignin, which have antimicrobial properties. A mixture of cellulose fibers and polyolein staple fibers may balance the sustainability, cost and final nonwoven performance.

Expected Outcome

How to select suitable cellulose fibers (different resources, e.g., wood, cotton and tunicate)

What blending ratios with polyolefin staple fibers and how to optimize the resultant hybrid nonwoven performance.

Example Problems

Development of staple fiber nonwoven based on a mixture of artificial polymer and biopolymer fibers.

Materials Research Focus Group
Characterization of Experimental Polymers

Research Topic ID#

2021-RT-26

Focus Group Thrust

Materials RFG

Comments

CW

Problem

As new polymers are developed and brought into the mainstream, such as PHA, PBS, and others, the characterization necessary for processing, use, and performance expectations is often unknown or poorly presented and understood by the manufacturer.

Expected Outcome

Characterize new polymers and systems through melt rheology, gel points, spinning performance, oxidative degradation, crystallization times, draw performance, and other techniques.

Example Problems

I see this as more likely being a Masters program. There will be a lot of work involved. If there are new techniques being developed which will improve the understanding of these materials, this could evolve into a PhD program.

Materials Research Focus Group
Effect of Finishes & Coatings on Biodegradability of Bio-Polymer Substrates

Research Topic ID#

2021-RT-27

Focus Group Thrust

Materials RFG

Comments

DA

Problem

The increased demand for and development of bio-polymers has led to many innovative solutions for the nonwovens industry. While the appeal to these polymers is their biodegradability/compostability/sustainability, functional finishes and coatings are needed for certain end use applications.

Expected Outcome

Currently, there is a lack of data to support that functional coatings and finishes do not adversely affect the biodegradability/compostability of bio-polymers. Also, there is a lack of understanding of how these surface coatings will affect the fiber properties in general.

Example Problems

Investigate the short term and long term effects and differences of treated and untreated bio-polymer substrates and potential solutions to neutralize any undesired reactions.

Effect of Finishes & Coatings on Biodegradability of Cellulosic Substrates

Research Topic ID#

2021-RT-28

Focus Group Thrust

Materials RFG

Comments

DA

Problem

The increased demand for and development of functional finishes and coatings has led to many innovative solutions for the nonwovens industry. While the appeal to these polymers is their biodegradability/compostability/sustainability, functional finishes and coatings are needed for certain end use applications.

Expected Outcome

Currently, there is a lack of data to support that functional coatings and finishes do not adversely affect the biodegradability/compostability of cellulosic substrates.

Example Problems

Investigate the short term and long term effects and differences of treated and untreated cellulosic substrates and potential solutions to neutralize any undesired reactions.

Materials Research Focus Group
Recycling Bicomponent Fibers

Research Topic ID#

2021-RT-29

Focus Group Thrust

Materials RFG

Comments

CW

Problem

The world is moving toward sustainability and conservation of resources. A common route to sustainability is recycling, practiced in a variety of ways currently. However, unlike aluminum (for example) which can easily be recycled, polymer properties degrade upon recycling so are often used only in specific applications and in lower percentages.

Bicomponent fibers are commonly used in nonwovens because of softness, bonding, loft, and performance.

Expected Outcome

The challenge in recycling bicomponent fibers and nonwovens produced therefrom is the natural mix of two components. In the nonwoven there may be a third component comprised of rayon or natural fibers. This creates a complex structure which does not lend itself to recycling in any “normal” fashion. This limits the applications, the methods of recycling, and degrades the performance of the nonwoven.

Example Problems

The goal is to understand and characterize the challenges of bicomponent materials such that methods can be developed to recycle them into nonwovens in suitable applications. This must include degradation, thermal limitations, and other pertinent properties such that techniques can be developed to bring these materials into the sustainable mainstream.

Materials Research Focus Group

Smart Nonwovens

Research Topic ID#

2021-RT-30

Focus Group Thrust

Materials RFG

Comments

RS

Problem

“Smart” nonwoven/fibers devices in medical, hygiene and even energy fields are attracting an increasing interests in both academic institutions and industry. A diaper with sensor function, reminding the change time; medical linen reflecting the patient movement status in healthcare center, as well as cloth can used as a smart display screen and even as a battery.

Expected Outcome

How to make sure the nonwoven is compatible with the sensors in terms of materials and processing

Example Problems

Obtain the requirements for involving sensors into nonwoven/fibers from companies, e.g., Simavta.
A theoretical selection and evaluation of polyolefin and polyester for “smart nonwoven”.
A joined development of smart nonwoven devices with external sensor companies.