Turning polymers into possibilities.

Recycling of Biodegradable Polymer: Zeus' New Technology

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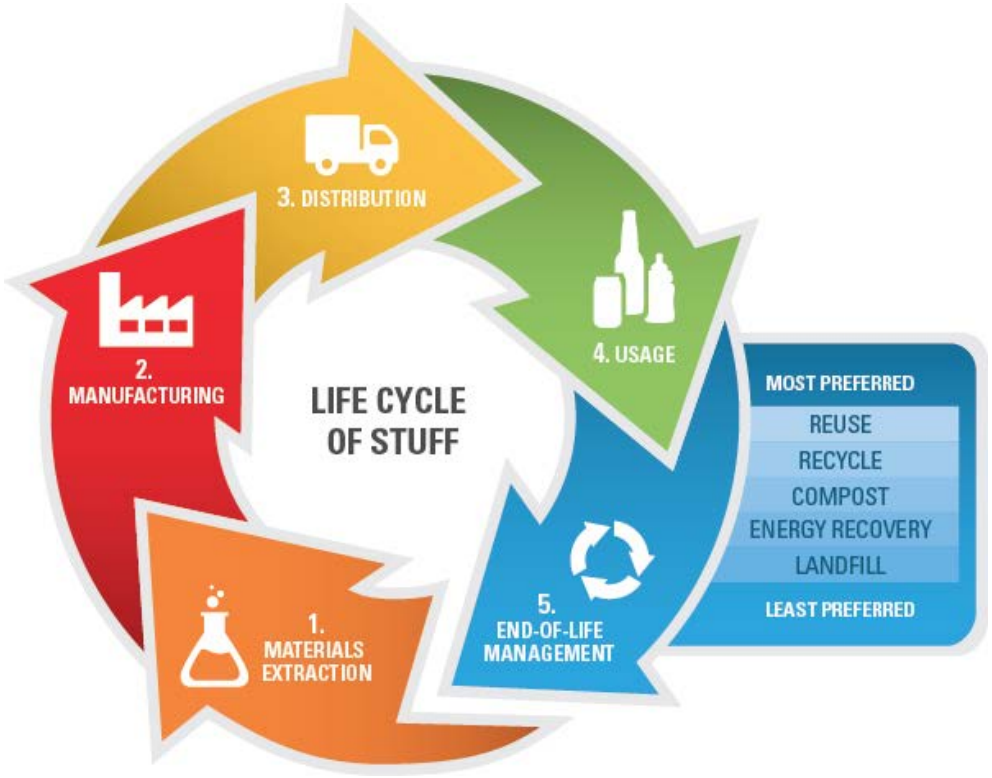
Objective and Overview

The objective of this training is to make you aware of Zeus' recycling technology and provide a protocol for handing inquiries.

Overview

- Background on end of life management for products
- What is Poly(Lactide)?
- Recycling Poly(Lactide)
- Zeus' Recycling Technology
  - What is the technology?
  - What are we offering?
  - Who might be interested?
  - What to do with an inquiry?

The Life Cycle of Products



https://19january2017snapshot.epa.gov/climatechange/climate-change-and-life-cycle-stuff_.html

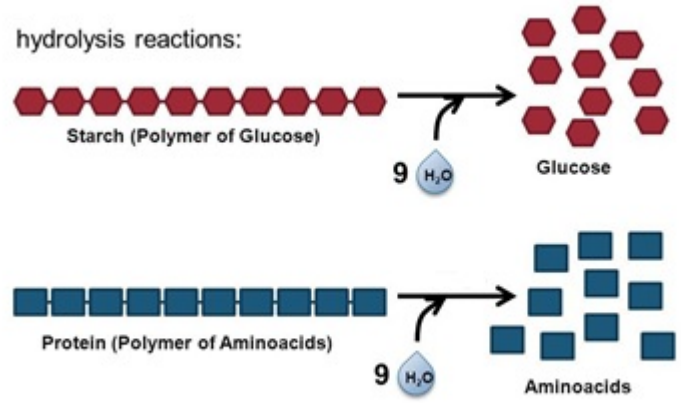
Recycling Plastics

- Mechanical Recycling
  - This is the most common method of recycling where plastics are separated by type, shredded or granulated, melted and blended, then shaped into something new.

http://www.maine.gov/dep/waste/recycle/whatrecyclablesbecome.html#1plastic

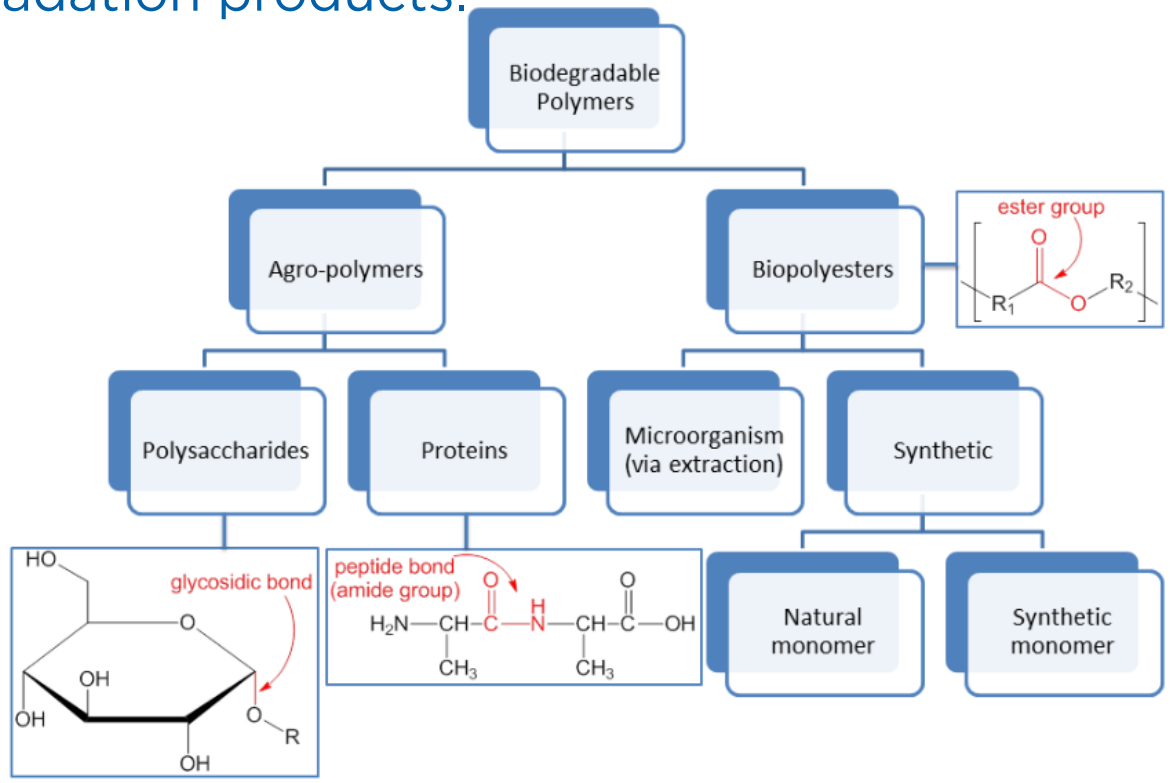
Recycling Plastics

- Chemical Recycling
  - This method breaks down the polymer chains of the plastics into monomers or other small molecule chemicals.



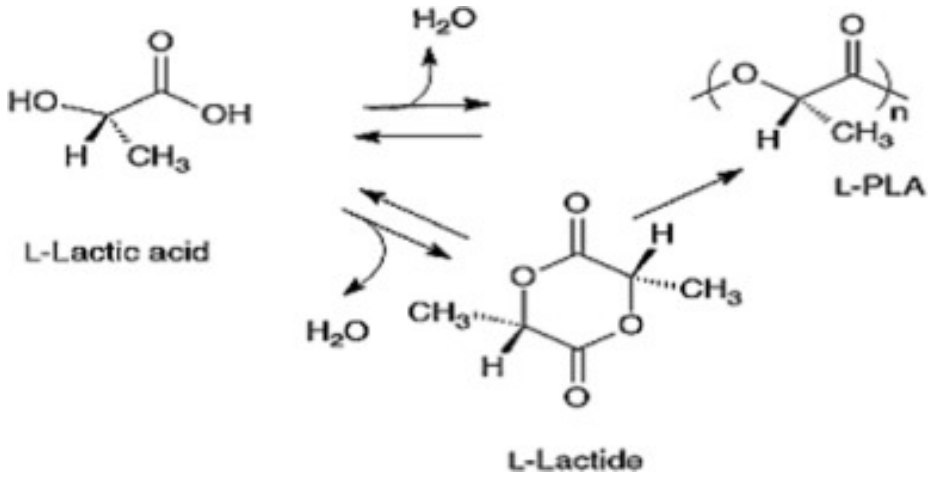
Biodegradable Polymers

- Biodegradable polymers contain polymer chains that are hydrolytically or enzymatically cleaved, resulting in soluble degradation products.



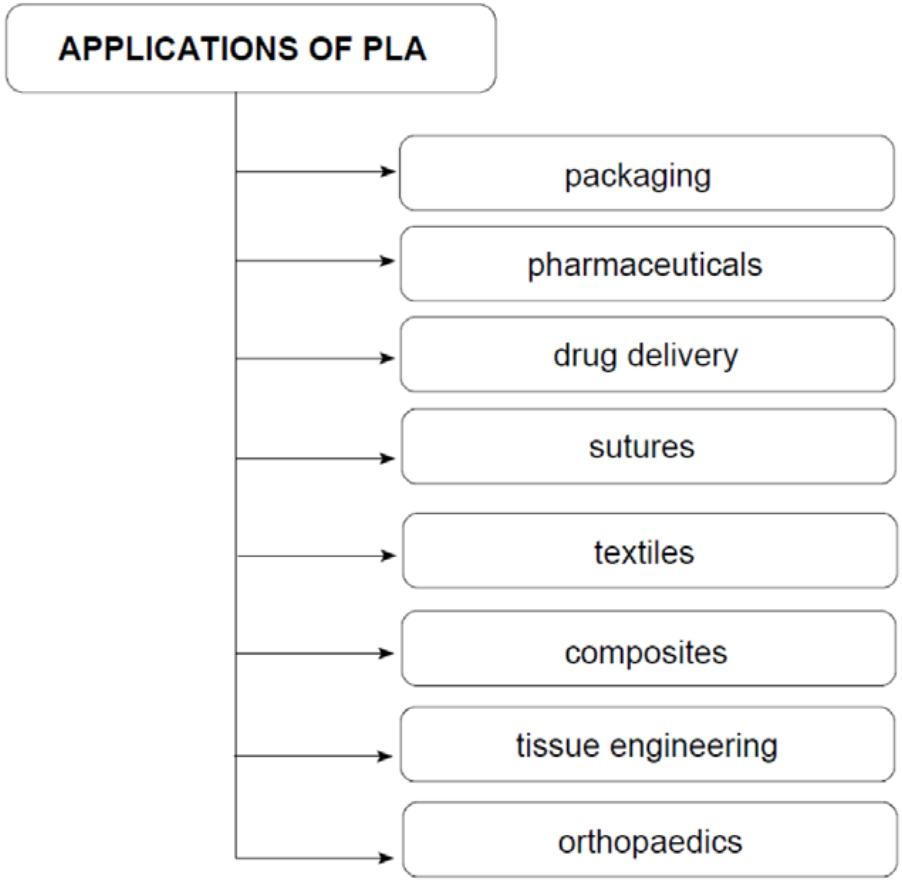
Polylactide

- Polylactide, also known as polylactic acid or PLA, is a biodegradable polyester derived from renewable plant resources



https://doi.org/10.1016/j.rser.2017.05.143

Applications of PLA



DOI: 10.18642/jmseat_7100121546

End of Life Options for PLA

	PROS	CONS
Chemical Recycling	• Recovers valuable raw materials • Provides a closed loop system for PLA with no loss in performance properties	• High Temperature, High Pressure systems required • Difficult to separate from other polyesters
Mechanical Recycling	• Converts material into new products • Familiar process (ease of adoption)	• Loss of Performance Properties • PLA contaminates other plastics being mechanically recycled
Incineration	• Recovers energy	• Low value recovered
Composting	• Provide nutrients to plants	• Composting facilities are limited • Low value recovered
Landfill	• Breaks down into benign components	• Sub-optimal conditions lead to slow degradation • No value recovered

Zeus' Technology & Benefits

- A chemical recycling technology that produces methyl lactate or lactic acid from PLA.
  - Works on a wide range of PLAs including high mw medical grade PLLA and commercial grade PLLA for food packaging
  - Can potentially be expanded to other materials, but that would be considered on a case by case basis

- Several significant advantages over existing technologies are:
  - High Efficiency (High % Recovery)
  - Low-Temperature, Low Pressure Processing
  - Economic Advantage
    - Less energy required compared to known chemical recycling
    - Recoverable processing aids
  - Separates PLA from a mixed waste stream (such as PET)

What are we offering and who might be interested?

- We offer this technology through a license agreement.
  - Patent Pending (US20180051156A1)
  - Zeus website will be updated with a microsite dedicated to this topic
  - White paper available
  - Technical paper being presenting at ANTEC May 8, 2018

- Who might be interested?
  - Polylactide or Lactide or Lactic Acid Manufacturers
  - Packaging companies adopting technologies to meet the Circular Economy Initiatives
  - Environmental or Green Technology Groups
  - Recycling Companies
  - Medical PLA converters looking to extract value from expensive scrap

What to do with an inquiry?

- Obtain the following information from the inquirer and send it to Bruce Anneaux and Jennifer McQuesten
  - First & Last Name
  - Company Name
  - Telephone
  - Email
  - How did you hear about this technology?
- Respond to the inquirer and include the following points:
  - Thank the inquirer for his or her interest
  - Let him or her know that his or her inquiry has been passed on internally
  - Bruce will follow up within 5 business days
  - Encourage the inquirer to check out Zeus' white paper available on the website, if he or she has not already seen it

Celebrating

1966-2016