PHA

(Polyhydroxyalkanoates)

A Truly Green Plastic

Biodegradable Plastic for Profile Extrusion & Injection Moulding

A Versatile Bioplastic for Permanent Products in Retail and Beyond

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What is biodegradable?

What's the difference between biodegradable and compostable?

- **Biodegradable:** Materials that naturally break down into water, CO_2, and biomass through microorganisms, leaving no harmful residues. Certified to ensure safe decomposition under specific conditions.

- **Compostable:** Biodegradable materials that decompose within a set timeframe in controlled composting environments (home or industrial), leaving nutrient-rich compost with no toxic residues.

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There's a lot of 'greenwashing' out there. How do you know if something is "Biodegradable" or a "Green" plastic – Let's have a look at PHA vs others.

Biodegradability: ✓ biodegradable ? conditionally ⊘ none

	Compostable		Biodegradable	
Plastic Type	**Industrial**	**Home**	**Soil**	**Marine**
Bio-PE	⊘	⊘	⊘	⊘
PLA	✓	⊘	⊘	⊘
PBS	✓	?	?	⊘
PBAT	✓	?	?	⊘
aPHA	✓	✓	✓	✓
scPHA	✓	✓	✓	✓

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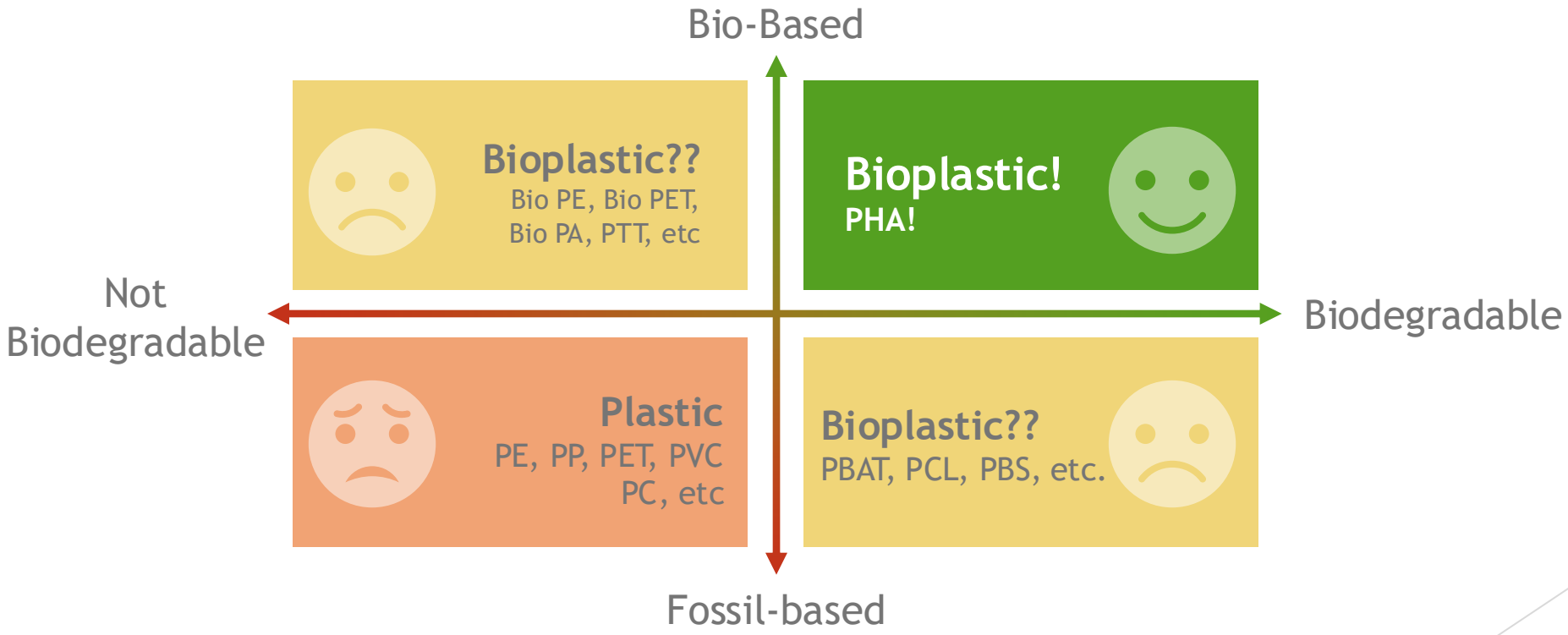
There are so many types of plastics.

- Did you know plastic can be Fossil-based and be biodegradable?
- Did you know plastic can be Bio-Based and NOT biodegradable.



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Let’s find out more about PHA

What’s it good for and what Canplex Profiles is doing with it!

Biodegradable Plastic for Profile Extrusion & Injection Moulding

PHA offers a transformative opportunity for reducing the carbon footprint of plastics while maintaining functionality and durability. Its ability to biodegrade across various environments and its lower greenhouse gas emissions make it a leading candidate for sustainable material innovation. These advantages position PHA as not just a solution for disposable products but also for durable applications in industries like retail and point-of-purchase displays.

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Canplex extrudes the first PHA Gripper and ESL Holder in North America!!

So what is PHA?

Where does it come from?

PHA is a biodegradable, bio-based plastic made by microorganisms through fermentation.

- A family of biodegradable polyesters produced by microbial fermentation
- PHA(Polyhydroxyalkanoate) is produced in nature by bacterial fermentation
- Many bacteria produce and use PHAs as an energy storage material in nature

Biodegradable
- Soil (Ambient)
- Home Compost
- Industrial Compost
- Fresh Water
- Marine Water
- Anaerobic

Biobased
Sugar used as feedstock
Other sources demonstrated

Products and Applications
PHAs can be compounded and processed using conventional plastics processing equipment.

Fermentation
Microbial engineering enables high polymer (PHA) accumulation in microbes.

Recovery
High Purity polymer is recovered and converted into usable form for downstream processing

Why PHA?

- Derived from renewable resources
- Reduced Carbon footprint
- Certified Green Technology
  - Biodegradable Certified (across industrial, home, soil and marine)
  - Bio Based Certified
  - Food Contact Compliant Certified
- Available in Rigid & Flexible
  - High durability and mechanical strength.
  - Resistant to wear and tear, suitable for long-term use.

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PHA comes in a number of different formulas and compounds.

What are we using?

Rigid PHA Compound

- Semi-Crystalline biodegradable resin
- Excellent biodegradability under anaerobic, aerobic, aquatic and compost conditions.

100% Bio-Content
TUV Certified Home and Industrial Compostable
TUV Certified Marine and Soil Biodegradable
High Heat stability
Anti-hydrolysis properties compared to typical biodegradable polymers

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Flexible PHA Compound (ShoreA53)

- Can be used for hinges, grippers, non slip pads, etc.
- Can be added to Rigid PHA as an impact modifier
- Has fundamentally different performance characteristics, softer and more rubbery than typical PHA in the market
- Suitable for compounding or as a modifier with other polymers

100% Bio-Content
TUV Certified Home and Industrial Compostable
TUV Certified Marine and Soil Biodegradable
Improves impact strength when used as an additive in other polymers
Enables faster composting when added to PLA

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Truth about PHA

- **TRUTH about PHA:**
  - High durability and mechanical strength.
  - Resistant to wear and tear, suitable for long-term use.
- **Examples of Applications:**
  - Retail displays, point-of-purchase products and accessories, grippers, ESL Holders.
  - Consumer products, hair combs, cellphone cases.
- Bioplastics **ARE NOT ONLY** for disposable or single use

How can Canplex help?

- Canplex is extruding and moulding PHA today!
- Canplex is the first custom profile extruder to process PHA in North America!
  - Source. CJ Biomaterials, Danimer Scientific, Avient Corp.
- Canplex can support you with extruded and injection moulded PHA products
- Canplex uses a custom blend of scPHA (rigid) and aPHA (flexible)
- The compound is made from ingredients with Biodegradable Certifications and we can share those with you.

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More about Biodegradability

- PHA is the only material that is industrial, home compostable, soil, and marine biodegradable
- The mean rate of biodegradation is 0.04–0.09 $mg \cdot day^{-1} \cdot cm^{-2}$ ($p = 0.05$).
- A PHA bottle has a mean lifetime of 1.5–3.5 yrs, a thin film lasts 0.1–0.2 yrs.

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Biodegradable Conditions for Certification

Biodegradation Process	Environmental Conditions
Industrial Compost	Industrial Composting Facility, Microbe, Oxygen at 58°C, within 6 Months
Home Compost	Backyard (Home) landfill at 28°C, within 12 months
Soil Biodegradability	Field, Forest, Soil at 25°C, within 24 Months
Marine Biodegradability	Seawater at 30°C within 6 months

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PHA Certifications

- **Are there PHA compounds that don't meet all biodegradable standards?**
  Yes, not all PHA compounds are the same. Some manufacturers may add ingredients to improve processability, which can reduce their biodegradable performance or prevent them from meeting certifications like marine biodegradability.
- **How do we ensure the highest standards?**
  We only use certified ingredients and provide full transparency about their status. Always ask for certifications, or marine biodegradability standards—to ensure the material meets your expectations.

Working with us means choosing responsibly sourced, verified materials you can trust.

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Lower Carbon Footprint

- PHA has a significantly lower footprint than other common plastics.
- estimated at **0.49-1.0 kg CO_2e per kg**

Plastic Type	Emissions (kg CO2e per kg of plastic)
PHA	**0.49-1.0**
Polyethylene (PE)	1.8 to 2.5
Polypropylene (PP)	1.9 to 2.3
Polyvinyl Chloride (PVC)	2.0 to 3.0
Polyethylene Terephthalate (PET)	3.0 to 4.0
Polystyrene (PS)	3.0 to 3.6
Polycarbonate (PC)	3.0 to 3.5

- https://plasticseurope.org/wp-content/uploads/2021/10/201009-Denkstatt-Report.pdf
- CO2e, or carbon dioxide equivalent, is a standardized metric used to measure the impact of various greenhouse gases (GHGs) on global warming. It expresses the effect of a given amount of a greenhouse gas in terms of the equivalent amount of carbon dioxide (CO2) that would produce the same warming effect.

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Why PHA Matters

- No Greenwashing here! This is real!
- Reduced Carbon Footprint over traditional plastics
- Breaks down into water, carbon dioxide, and biomass in natural environments.
- Reduce contribution to pollution and landfill.
- Will biodegrade in a Marine Environment
- **Does not break down into micro plastics!!**

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Applications in the Retail Environment

- Why PHA is Ideal for Retail:
- Durable enough for permanent and semi permanent fixtures, signage accessories, clips, and displays.
- Suitable for shelf strips for UPC, Electronic Shelf Labels and Colour Strips.
- Aesthetically pleasing with customizable colours.
- Can replace many common existing POP/Retail Accessories that use traditional fossil fuel based, non biodegradable materials.
- Meets the demands of the consumer, brands and retailers looking for industry to provide better, more sustainable solutions.
- Focus should be on mechanical fastening rather than adhesives/double sided tapes

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Benefits Summary

Key Takeaways:

- Sustainable and biodegradable material.
- Reduced carbon footprint
- Durable enough for permanent applications.
- Reduces environmental impact while maintaining high performance.
- The market and your customers are demanding solutions!

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Canplex is here to help you switch to PHA biodegradable plastic!

- Help us lead the adoption of PHA and drive the use of PHA in retail, consumer products and other industries.
- Email sales@canplex.com to speak to someone about PHA.

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