PHA bioplastics – foremost solution for food packaging

A harsh global spotlight on the environmental damage caused by single-use plastics is driving business to reconsider the impact of products, processes and packaging.Businesses across all industries are beginning to realize the potential of innovation to improve both profit and sustainability.

Bioplastics—plastics that are bio-derived, biodegradable or both—are an increasingly feasible technical alternative to conventional polymers. New industrial processes now mean that bioplastics can be produced from post-consumer content, converting environmentally damaging waste into a valuable resource to be used as a feedstock for these processes.

Till date, the use of bioplastics in food service has been limited by technical performance at high temperatures, cost and limited supply. While there has been limited introduction of cups for cold beverages made from polylactic acid (PLA), a bioplastic derived from cornstarch, these are not suitable for hot drinks.

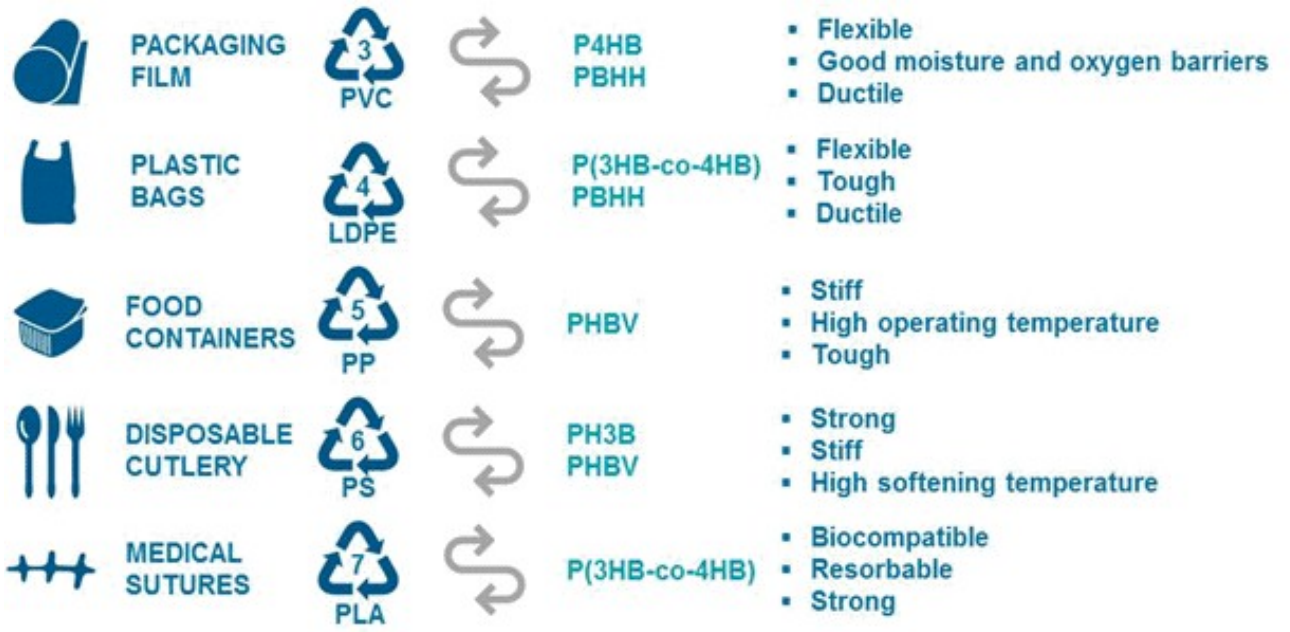
PHA (Poly-Hydroxy-Alkanoates or polyhydroxy fatty acids) is a family of biobased polyesters that are suitable for even the most challenging convenience food applications. PHAs are biodegradable, readily compostable thermoplastics, produced by microbial fermentation of carbon-based feedstocks. The properties of PHA polymers are customizable to the application, depending on the specific combinations of different monomers incorporated into the polymer chain.

Examples of Polyhydroxyalkanoates are

- PHB, PHV, PHBV, PHBH and many more.
- poly-4-hydroxybutyrate (P4HB)
- poly-3-hydroxybutyrate (P3HB)
- poly-3-hydroxyvalerate (P3HV)
- poly(3-hydroxybutyrate-co-3-hydroxyvalerate) or PHVB co-polymer
- poly (3-hydroxybutyrate-co-3-hydroxyhexanoate) or PHBH

That's why we speak about the PHA platform.This PHA-platform is made up of a large variety of bioplastics raw materials made from many different renewable resources. Depending on the type of PHA, they can be used for applications in films and rigid packaging, biomedical applications, automotive, consumer electronics, appliances, toys, glues, adhesives, paints, coatings, fibers for woven and non-woven and inks. So PHAs cover a broad range of properties and applications.

Infograph given below visually summarizes the physical requirements of some common plastic products, the current materials that fulfil these requirements and the PHA types that can replace these traditional materials.



What makes PHA bioplastics special?

The most important feature of PHA is its “tuneable” property. PHA is not one chemical structure, it is a whole family of related polymers. Depending on the production process and the feedstocks used, different polymers with different physical properties can be produced. PHAs can either be homopolymers; where only one PHA is used to build the polymer chain, or copolymers; where more than one PHA is employed to build the chain. Typically, homopolymers have rather lower mechanical properties that cannot be easily altered.

Copolymers on the other hand have properties that can be tuned between a certain range, and often can have properties that are superior than either one of the monomers alone. For this reason, it is far more common to find PHA copolymers rather than homopolymers in most applications.Beverage applications require polymers that maintain their properties when in contact with liquids up to 100 ºC that PHA copolymers can easily sustain.

PHA is also the only biopolymer which is produced via industrial fermentation - a process similar to brewing rather than the chemical synthesis used to produce most biopolymers. Recent technical development allow use of low cost organic wastes can be used as a feedstock, reducing dependence on costly starch rich crops as feedstock.

Low cost industrial by-products and organic waste as feedstocks for PHAs

- Molasses from sugar processing
- Whey (watery part of milk that remains after formation of curd / cheese)
- Ligno-cellulosic materials (crop by-products like rice husk, bagasse, rice bran)
- Glycerol (by-product during production of bio-diesel)
- Fats, vegetable oils and waste cooking oils
- Vegetable waste (e.g. potato skin peels, tomato skins, cauliflower stems)
- Waste water streams (e.g. sugar, vegetable processing, paper plants)

What's possible now with bioplastics and what's foreseeable in the near future

Current		Future
Refuse sacks, compost bin liners, carrier bags, gift bags, shrink wrap	Packaging	Bottles, laminated foils
Disposable gloves, disposable aprons, liners for coffee cups, foam packaging	Food service	Food containers and utensils
Mulching film, plant pots	Agriculture	Slow release of fertilizers etc into soil
Absorbable sutures, absorbable mesh, absorbable surgical film, composite mesh	Medical	Microencapsulation, slow release drug formulations, cartilage engineering, stents, wound dressings, bone plates, high performance filters, syringes, gowns, gloves
Phone case, furniture	Consumer Products	Sanitary goods, wipes, textiles, toys, cosmetics (microbeads), interior design
Plastic additives	Chemicals	Adhesives, paints, coatings, fine chemicals
	Environmental Services	Oil slick remediation, denitrification (water treatment)
	Automotive	Automotive parts
	Electronics	Pressure sensors for heat sealing components, toner, electronic casings
	Fishing	Fishing nets and lures
	Energy	Fuels

Different products with PHA

PHA to Hold Strongest Growth in Compostable Plastic Packaging Materials Market

Source: SpecialChem- 27.04.2018

The global market for compostable plastic packaging material is expected to grow at a CAGR of 5.1% during the forecast period of 2018-2028. The market will reach a value of over US$ 2,000 Mn by the end of 2028. Compostable plastic packaging is a major part of the current eco-friendly plastics market. The market comprises various materials like PBAT, PBS, PLA, and PHA, all of which are made up of components that are highly decomposable. Among these, PHA is expected to hold the strongest market growth, owing to its high barrier properties.Food, beverage and pharmaceutical products require high barrier material for packaging to extend the shelf life of the products and maintain the quality of the product. According to thereport on the global compostable plastic packaging materials market, PHA plastic type is expected to witness a stellar CAGR of 15.9% during the 10 year forecast period.

Tamil Nadu to ban plastic coated paper cups from January 2019

Hindu Business Line – 26th July 2018

Tamil Nadu has decided to ban LDPE coated paper cups from January 2019. There are over 20 coating units and 500 cup manufacturers in Tamil Nadu only. The market size is estimated to be around 12,000 tons of cups per month in Tamil Nadu alone. The ban is expected to widen to other plastic coated and taken up by other progressive states. (This provides very good opportunity for a bio-degradable plastic like PHAs for coating on paper cups, disposable plates& cutlery drinking straws etc.)

As a first step we can prepare a Techno Economic Project Feasibility Report that will provide a realistic picture and help you to take an informed business decision, approach banks for project finance and government departments for statutory approvals. Typical contents of the project feasibility report are:

1.0 What are bio-degradable bio-plastics, different types and end applications
2.0 What are PHA bioplastics &their different types
2.1 Why PHA bioplastics?
3.0 Other bio-degradable bioplastics – advantages & disadvantages
4.0 Suggested production volume & project parameters
5.0 Production process & technology
5.1 Production flow diagram

5.2 Chemistry behind the microbial brewing production process
6.0 Main plant & machinery with basic specifications and indicative price
7.0 Utilities & Support facility with basic specifications and indicative price
8.0 Quality Control & Testing Lab with indicative prices
9.0 Estimated Project Cost
10.0 Manpower requirement & cost
11.0 Estimated Product Cost (raw material, additives, production, overheads)
12.0 Estimated Turnover, Profitability & Project Payback Period
13.0 Working Capital requirement
14.0 Factory area & building requirement
15.0 Product guiding specifications & test standards
15.1 Product pricing vis-à-vis commodity and other bioplastics
15.2 Product characteristics vis-à-vis commodity and other bioplastics
15.3 Key market segments and end applications
16.0 Market Scenario
16.1 Current global production & main players
16.2 Share of bioplastics in different end application sectors
16.3 Market potential and growth prospects of bioplastics
16.4 Key market segments for PHAs – volume and growth prospects
17.0 Global process technology providers

One you decide to go ahead we can assist in selection and sourcing manufacturing know-how and develop pilot plant for proof of concept. Thereafter we can assist you to set-up full scale production plant – selection of plant & machinery, plant layout and design, selection of utilities and support equipment, commissioning of plant, sourcing of additives, quality control and testing systems, product technical qualification, target market segments, end application know-how, market intelligence etc.

Best regards

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