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# BioPlastics

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Biodegradable plastics is made with plant-based materials. Plastics can be produced from starch. Starch is a natural polymer.

It is a white, granular carbohydrate produced by plants during photosynthesis and it serves as the plant's energy store. Cereal plants and tubers normally contain starch in large proportions.

Starch can be processed directly into a bioplastic but, because it is soluble in water, articles made from starch will swell and deform when exposed to moisture, limiting its use. This problem can be overcome by modifying the starch into a different polymer. First, starch is harvested from corn, wheat or potatoes, then microorganisms transform it into lactic acid, a monomer. Finally, the lactic acid is chemically treated to cause the molecules of lactic acid to link up into long chains or polymers, which bond together to form a plastic called polylactide (PLA).

PLA can be used for products such as plant pots and disposable nappies. It has been commercially available since 1990, and certain blends have proved successful in medical implants, sutures and drug delivery systems because of their capacity to dissolve away over time. However, because PLA is significantly more expensive than conventional plastics it has failed to win widespread consumer acceptance.

### **Polylactic acid or polylactide (PLA)**

Polylactic acid or polylactide (PLA) is a biodegradable, thermoplastic, aliphatic polyester derived from renewable resources, such as corn starch (in the U.S.) or sugarcanes (rest of world).

Because it is biodegradable, it can also be employed in the preparation of bioplastic, useful for producing loose-fill packaging, compost bags, food packaging, and disposable tableware.

In the form of fibers and non-woven textiles, PLA also has many potential uses, for example as upholstery, disposable garments, awnings, feminine hygiene products, and nappies.

PLA is a sustainable alternative to petrochemical-derived products, since the lactides from which it is ultimately produced can be derived from the fermentation of agricultural by-products such as corn starch or other carbohydrate-rich substances like maize, sugar or wheat.

PLA is more expensive than many petroleum-derived commodity plastics, but its price has been falling as production increases. The demand for corn is growing, both due to the use of corn for bioethanol and for corn-dependent commodities, including PLA.

### **Plastarch Material (PSM)**

PSM - Plastarch Material is a biodegradable, thermoplastic resin. It is composed of starch combined with several other biodegradable materials. The starch is modified in order to obtain heat-resistant properties, making PSM one of few bioplastics capable of withstanding high temperatures.

PSM is stable in the atmosphere, but biodegradable in compost, wet soil, fresh water, seawater, and activated sludge where microorganisms exist. It has a softening temperature of 257°F (125°C) and a melting temperature of 313°F (156°C).



It is also hygroscopic. The material has to be dried in a material dryer at 150°F (66°C) for five hours or 180°F (82°C) for three hours. For injection molding and extrusion the barrel temperatures should be at 340° +/- 10°F (171°C) with the nozzle/die at 360°F (182°C).

Since PSM is derived from a renewable resource (corn), it has become an attractive alternative to petrochemical-derived products. Unlike plastic, PSM can also be disposed of through incineration, resulting in non-toxic smoke and a white residue, which can be used as fertilizer.

PSM is currently used for a wide variety of applications in the plastic market, such as food packaging and utensils, personal care items, plastic bags, temporary construction tubing, industrial foam packaging, industrial and agricultural film, window insulation, construction stakes, and horticulture planters.

## **Bioplastic Advantages**

### Advantages of PLA

It is similar to the feature of conventional plastics. However, it won't cause any negative environmental impact due to the fact that it is natural, non-toxic and 100% biodegradable material.

### Advantage of PSM

PP products are able to withstand heat up to 120 degrees Celsius and freezable to -20 degrees Celsius and are completely safe for human use, which meets the food and beverage use standards. Also, PP is environmental material, which is non-toxic and smokeless and doesn't have pollution when burning. Besides, it can be collected and recycled, saving energy requirement.