

# Bio-Based Polymers

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### Abstract

Bio-based polymers are defined as material where at least a portion of the polymer consists of material produced from renewable raw materials. For example, bio-based polymers may be produced from corn or sugar cane. The remaining portion of the polymers may be from fossil fuel-based carbon. Bio-based polymers have generally lower CO<sub>2</sub> footprint and are associated with the concept of sustainability. The total bio-based polymer market represents a tiny portion—about 1%—of the global polymer market. However, the market for bio-based polymers is expected to grow faster with growing usage in the beverage packaging industry, cost reduction, increasing government support for adopting bio-based materials, and rising consumer acceptance.

The largest potential market for bio-based biodegradable polymer is in the packaging industry. Consumption of biodegradable polymer is expected to grow globally at an average annual rate of 9% between 2017 and 2022. Polylactic acid (PLA) and polyhydroxyalkanoates (PHAs) are both major bio-based biodegradable plastics. Most of the PLA produced is used for packaging. PHAs are versatile biodegradable bio-based polymers that can be used in a wide range of applications. Poor production economics have limited commercialization of PHAs.

Conventional bottle-grade polyethylene terephthalate (PET) resin is used to produce beverage bottles. The plastic bottle beverage industry has been under intense pressure over the amount of PET produced and the solid waste generated from discarded conventional PET-based bottles. Responsible and sustainable PET consumption has been a major goal. Feedstocks for PET are petroleum-based. To achieve sustainability, bio-based feedstocks for PET production are being commercialized.

This report examines production technologies for PLA and its monomer lactic acid, PHA, and bio-based PET, and evaluates the process economics for producing the polymers and lactic acid. This report will be of value to those companies engaging in the production of bio-based polymers and conventional petroleum-derived feedstock-based polymers.

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