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Bio-Based Polymers

By Susan L. Bell

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PEP Report 265A

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Abstract

Bio-based polymers are defined as materials for which 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 sugarcane. The remaining portion of the polymers may be from fossil fuel-based carbon. Bio-based polymers generally have a lower CO₂ footprint and are associated with the concept of sustainability. Because of concerns about the depletion of fossil resources and the global warming associated with the use of petrochemicals, new bio-based polymers continue to be developed.

Several new bio-based polymers have been commercialized. A bio-based polycarbonate, isosorbide polycarbonate, can potentially be used as an alternative to petroleum-based polycarbonate. Corn-based isosorbide is used as a replacement for bisphenol A (BPA) monomer. Bio-based polybutylene succinate (PBS) resin prepared from bio-based succinic acid and bio-based 1,4-butanediol (BDO) can replace biodegradable petrochemical-based PBS. Green polyethylene has been commercialized with bio-based ethylene.

In this report, recent developments in bio-based polymers since our last report published in 2008 are discussed. This report reviews the production of the bio-based monomers required to produce isosorbide polycarbonate, polybutylene succinate, and polyethylene. The process economics for producing the monomers and polymers are evaluated. Comparative process economics for the conventional petroleum-derived polymers are included. This report will be of value to those companies engaged in the production of bio-based polymers and the conventional petroleum-derived-feedstock-based polymers.

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