Chemists report biorenewable, biodegradable plastic alternative

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Colorado State University polymer chemists have taken another step toward a future of high-performance, biorenewable, biodegradable plastics.

Publishing in *Nature Communications*, the team led by Professor of Chemistry Eugene Chen describes chemical synthesis of a polymer called bacterial poly(3-hydroxybutyrate) – or P_3HB. The compound shows early promise as a substitute for petroleum plastics in major industrial uses.

P_3HB is a biomaterial, typically produced by bacteria, algae and other microorganisms, and is used in some biomedical applications. Its high production costs and limited volumes render the material impractical in more widespread commodity applications, however.

The team, which includes the paper's first author and research scientist Xiaoyan Tang, used a starting material called succinate, an ester form of succinic acid. This acid is produced via fermentation of glucose and is first on the U.S. Department of Energy's list of top 12 biomass-derived compounds best positioned to replace petroleum-derived chemicals.

The researchers' new chemical synthesis route produces P_3HB that's similar in performance to bacterial P_3HB, but their route is faster and offers potential for larger-scale, cost-effective production for commodity plastic applications. This new route is enabled by a class of powerful new catalysts they have designed and synthesized. They have filed a provisional patent through CSU Ventures for the new technology.

More information: Xiaoyan Tang et al. Chemical synthesis of perfectly isotactic and high melting bacterial poly(3-hydroxybutyrate) from bio-sourced racemic cyclic diolide, *Nature Communications* (2018). DOI: 10.1038/s41467-018-04734-3

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