A comprehensive metabolic map for production of bio-based chemicals

Production of industrial chemicals using renewable biomass feedstock is becoming increasingly important to address limited fossil resources, climate change and other environmental problems. To develop high-performance microbial cell factories, equivalent to chemical plants, microorganisms undergo systematic metabolic engineering to efficiently convert biomass-derived carbon sources into target chemicals. Over the past two decades, many engineered microorganisms capable of producing natural and non-natural chemicals have been developed. This Review details the current status of representative industrial chemicals that are produced through biological and/or chemical reactions. We present a comprehensive bio-based chemicals map that highlights the strategies and pathways of single or multiple biological reactions, chemical reactions and combinations thereof towards production of particular chemicals of interest. Future challenges are also discussed to enable production of even more diverse chemicals and more efficient production of chemicals from renewable feedstocks.

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Corresponding author: Lee, S. Y.
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