

Combined gasification-fermentation process in waste biorefinery

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Abstract

Thermal processes of wastes lead to production of energy in form of electricity and/or heat. However, if the goal is to produce materials, thermochemical processes can be applied. These processes via e.g. gasification produce raw syngas that is a mixture of principally H₂, CO and CO₂, with some impurities. This raw syngas is traditionally cleaned and catalytically treated via chemical processes such as Fischer-Tropsch. However, as there is a variety of microorganisms that can assimilate syngas, this gas can be used as a substrate to produce different chemicals via biochemical routes. This chapter is dedicated to describe an efficient thermochemical-biochemical route of waste treatment. The gasification process, the design and the factors that affect the syngas composition are firstly described. Thereafter, the microbiology, biochemical reactions, metabolic pathways and process conditions toward production of several metabolic products from syngas such as carboxylic acids, ethanol, butanol, 2,3-butanediol, methane and biopolymers are presented.

Keywords: Gasification; Fermentation; Biofuels; Valuable chemicals.