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Bioprocess for production of 2,3 butandiol using non-pathogenic Clostridia from industrial residual streams

The objective of the present invention to provide methods and means which allow the production of 2,3-Butanediol (23BD) using non-pathogenic organisms and spent sulfite liquor (SSL) as a substrate.

BACKGROUND

Spent pulping streams are an interesting substrate for biorefinery concepts. However, they contain inhibiting substances that hinder the growth of most microorganisms. The utilization of the sugars in spent pulping streams as feedstock for biorefinery processes generating biofuels has been tested on the example of ABE (acetone-butanol-ethanol) production with Clostridia spp..

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It was found, that ABE producing Clostridia spp. can, upon change of their metabolism, utilize the sugars in spent sulfite pulping liquor for the production of 23BD. This change in metabolism is triggered via an adaptation step, consisting on a cultivation on spent sulfite pulping liquor. After the activation of the 23BD metabolism, 23BD can also be generated in cultivations on synthetic medium.
Titers of up to 10gL^{-1} were reached in a non optimized process environment. The process was developed in a scalable strategy, allowing application of the technology to large residual streams.

BENEFITS

In contrast to conventional strains used for 23BD production (*Klebsiella, Enterobacter*), ABE producing Clostridia are not pathogenic. Pretreatment of spent pulping streams can be minimized.
In contrast to other bioprocesses utilizing spent pulping streams (bioethanol, biobutanol), this minimized pretreatment consists only of an overliming step (pH10), subsequent neutralization and addition of essential media components.
23BD has a higher added value than ABE and in addition waste streams from the pulping industry can be used as a substrate, posing a novel option of process intensification for pulping industries. Hence, the proposed bio-process is a clear option for process intensification. A publication (Köpke, et al, 2011) estimated the annual worldwide market of the downstream products of 23BD to be about 32 million tons, with a market value of about $43 billion dollars.

POTENTIAL APPLICATIONS

- Use of residual SSL sources from pulp and paper industries.
- Production of 23BD as a valuable compound, which is a chemical building block which easily ties in into chemical industry for further value added processing.
- Extension to other industrial residual streams as the conditioned strain is able to produce 23BD also on other sources.

REFERENCE:
M054/2015

AVAILABLE FOR:
- License Agreement
- R&D cooperation

KEYWORDS:
- bioprocess 2,3 BD
- metabolic shift
- "waste to value"
- non-pathogenic strains

DEVELOPMENT STATUS:
A test-setup based on lab-equipment was used to successfully verify the applications.

IPR:
Patent is filed in AT.

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