BIOLOGICAL FERMENTATION OF SYNGAS

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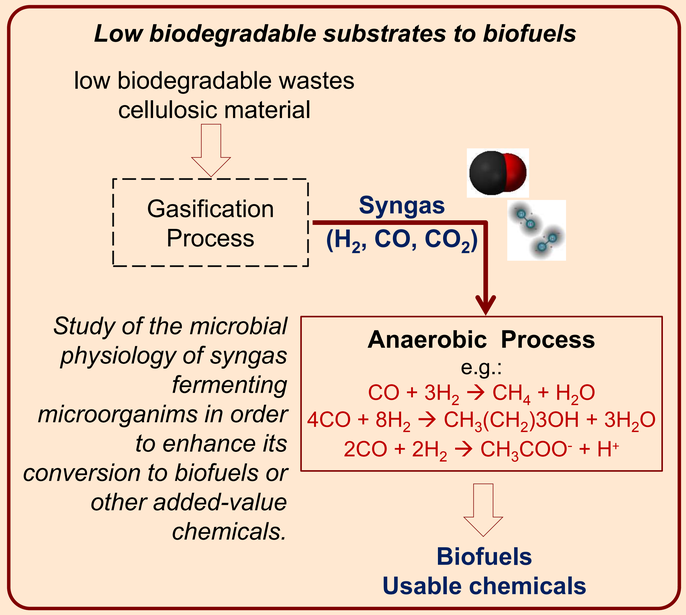
Introduction

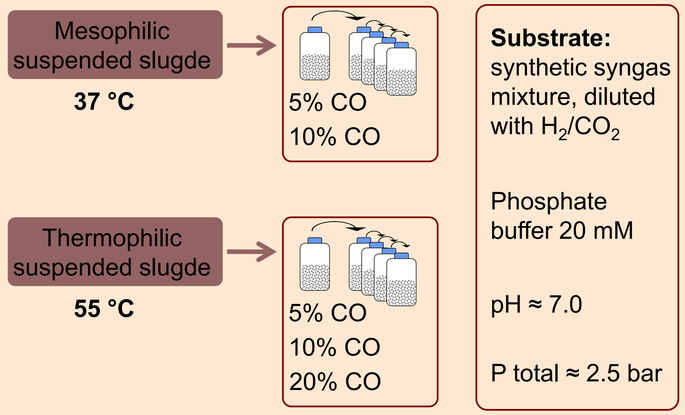
Syngas or synthesis gas is produced during the gasification of different materials, e.g. coal, oil and natural gas, tar sands, recalcitrant wastes, lignocellulosic biomass, and sewage sludge. The principal components of syngas are carbon monoxide (CO), hydrogen (H_2), and carbon dioxide (CO_2). Both catalytic and biological processes can be used for the production of biofuels and bulk chemicals from syngas. The development of novel bioprocesses for syngas conversion to added-value products is a promising field comprising some advantages over the chemical processes. However, potential for biological conversion of syngas is still rather unexplored within the bioprocess engineering community.

The main goal of this work is to explore the potencial of biogas or other valuable compounds production from syngas.



Methods

In order to study the potential of different inocula for the synthesis of various interesting products from syngas, synthetic mixtures of CO, CO_2 and H_2 with different $CO:CO_2:H_2$ ratios and different operational conditions, namely temperature and pressure, were tested in batch assays.



Headspace composition (H_2, CO_2, CH_4, CO)

GC-TCD

Volatile fatty-acids and alcohols

HPLC

Microbial dynamics of syngas-enriched cultures

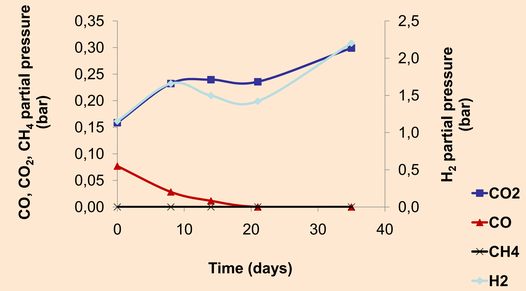
Total DNA isolation

16s rRNA gene amplification (PCR)

Microbial diversity and shifts (DGGE)

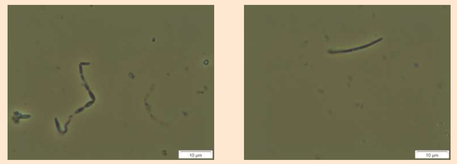
Results and Conclusions

55 ºC | 10% CO | 35 days incubation



The thermophilic suspended slugde used offers potential advantages over the use of mesophilic suspended slugde, related to the CO consumption.

After more than 5 successive transfers (that correspond to more than 100 days of incubation) and increasing the CO concentration from 5% to 60%, by using a phase contrast microscope, it was observed only two different morphological types of microorganisms. This fact indicates a specialization of the inocula in CO-consuming microorganisms.



Successive transfers with syngas as a substrate, with different concentrations of CO, are being performed, aiming the isolation of novel syngas- or CO-utilizing microorganisms.

Acknowledgements

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