Sustainable Process Engineering
Chemical Reactor Engineering

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

An experimental study on the behavior of syngas fermenting bacteria inside the spinning disc reactor

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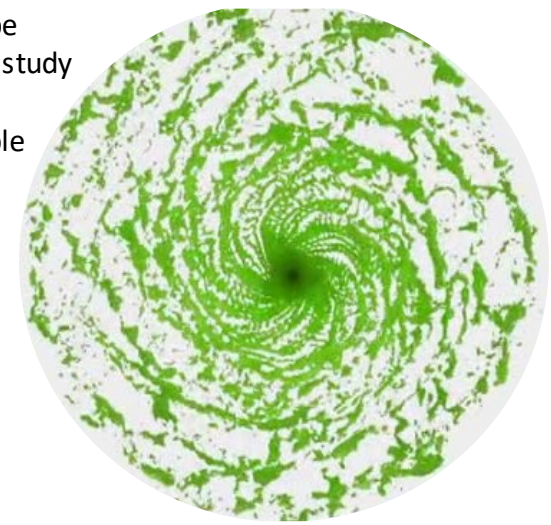
Introduction

The standard equipment for syngas fermentation are stirred tank reactors and bubble columns. However, in these syngas bioreactors the yield is limited by gas to liquid mass transfer and a maximum product concentration. To improve the yield of the syngas bioreactor a new reactor design is introduced, the spinning disc (SD) reactor. The SD has already proven by previous studies to increase the mass transfer rates with a factor 40. By implementing syngas fermenting bacteria the mass transfer problem can be reduced, hence increasing the yield.

Project summary

A downside of the SD are the large shear forces that are present in the reactor, due to these forces the bacteria can die. In order to find a region in which the bacteria will live long enough to convert the syngas, a study on the bacterial behavior inside the SD is necessary. The study will contain the analysis of the effect of the operational conditions acting on the bacteria inside the SD. This will lead to a range within the SD can operate without destroying all the bacteria. Possible conditions are: pressure, temperature, bacterial concentration, flow rate, etc.. From these experiments a model for the bacterial death rate can be created. With the death rate known a preferable operating regime can be determined. By operating the SD in this regime a mass transfer study can be performed. The mass transfer rates can be compared with literature to give a prediction of the theoretically achievable yield inside the SD.



Project goals

- Analysis of the effects of the operation conditions inside the SD acting on the bacteria
- Modeling of the bacterial death rate inside the SD
- Determine and compare the mass transfer rates inside the spinning disc reactor with literature

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