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## **SYNFERON WP2: mixed microbial culture-based syngas fermentation**

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### **Abstract**

The fermentation of biomass-derived syngas is a promising approach for the production of chemicals and biofuels as it presents advantages derived from both thermochemical and biochemical conversion processes. The gasification provides high conversion efficiency for all biomass fractions and opens the way for the conversion of a wide array of feedstocks into synthesis gas, such as non-fermentable by-products, forestry residues and municipal solid wastes [1]. On the other hand, the biological conversion of syngas constitutes a cost-effective platform for the biosynthesis of several products as it operates at mild temperatures and pressures, and syngas-reforming is not required [2]. Additionally, using mixed cultures may allow decreasing further the operation costs of the fermentation process due to the non-sterile operation, their high adaptive capacity and their high tolerance to syngas impurities [2,3]. SYNFERON aims at integrating the abovementioned benefits of thermochemical processes and the mixed culture approach for the biological conversion of syngas into biomethane and solvents.

Recent developments of the SYNFERON project on the fermentation of syngas into biomethane and solvents will be summarized. The syngas biomethanation process was modelled at both mesophilic (37 °C) and thermophilic (60 °C) conditions in batch operating mode. The model structure adopted was similar to the Anaerobic Digestion Model no. 1 (ADM1), considering growth of all microbial groups involved in the conversion of syngas, and presented dynamic product yields as a function of the thermodynamic feasibility of certain reactions. Regarding the production of solvents, the effect of several operational parameters on the production of ethanol and butanol was studied using different process configurations. Lastly, the effect of different cryopreservation agents on the long-term preservation of anaerobic acetogenic mixed cultures was assessed based on both the microbial activity and microbial diversity upon reactivation.

### **References**

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