BioRECO2VER

Biological routes for CO_2 conversion into chemical building blocks

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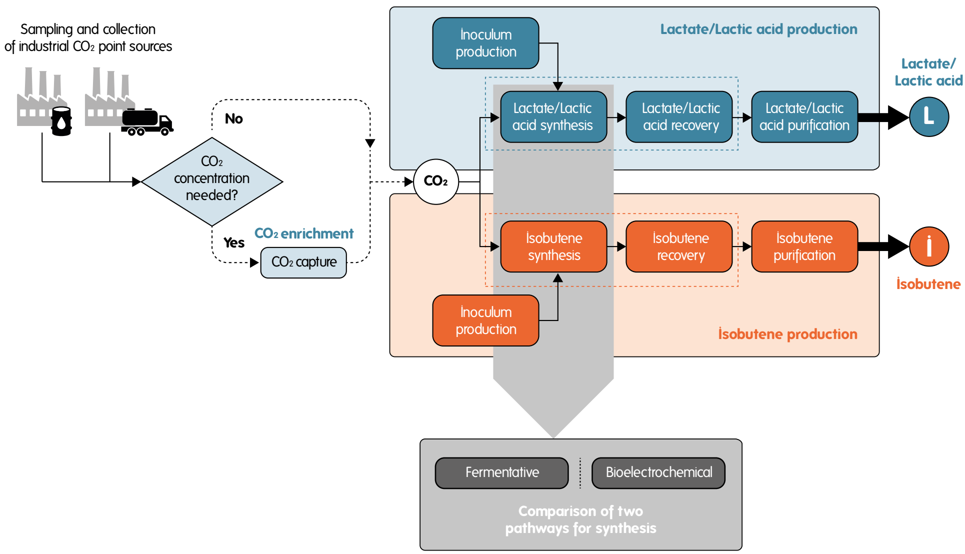
BioRECO2VER aims to demonstrate the technical feasibility of more energy efficient and sustainable non-photo-synthetic, biotechnological processes for the capture and conversion of CO_2 from industrial point sources like refineries and cement production plants into valuable platform chemicals, such as isobutene and lactate.

To overcome several of the existing technical and economic barriers for CO_2 conversion by industrial biotechnology, BioRECO2VER will focus on minimizing gas pre-treatment costs, maximizing gas transfer in bioreactors, preventing product inhibition, minimizing product recovery costs, reducing footprint and improving scalability.

To this end, a hybrid enzymatic process will be investigated for CO_2 capture from industrial point sources and conversion of captured CO_2 into the targeted end-products will be realized through three different proprietary microbial platforms which are representative of a much wider range of products and applications. Bio-process development and optimization will occur along two lines: fermentation and bioelectrochemical systems.

The general concept of BioRECO2VER



Climate change and the need for alternative carbon feedstocks in chemical industry

Greenhouse gas emissions could cause global average temperatures to increase by 4°C or more by 2100 and by 1.5 to 2 times as much in many midcontinent and northern locations.

These emissions are strongly linked to the current (>90%) fossil-based processes to produce chemicals and materials. Since carbon is an essential constituent in many chemicals and materials, the chemical industry thus faces the long-term challenge to move towards a CO_2 neutral rather than a carbon-free world and efforts are undertaken to broaden its feedstock basis.

While biomass is increasingly being used, CO_2 and renewable energy are the only abundant sources of energy and carbon on the long term and the ultimate sustainable resources in the circular economy. Therefore, carbon capture and the utilization via microbial conversion into valuable platform chemicals is combined within BioRECO$_2$VER to set a representative base for a future much wider range of products and applications.

Targets of BioRECO$_2$VER:

- Development and application of robust enzymes for efficient CO_2 capture from industrial point sources by combining enzymatic absorption with ionic liquid-amine blends

- Development of three different microbial platforms for CO_2 conversion into platform chemicals using carbon-free energy supply

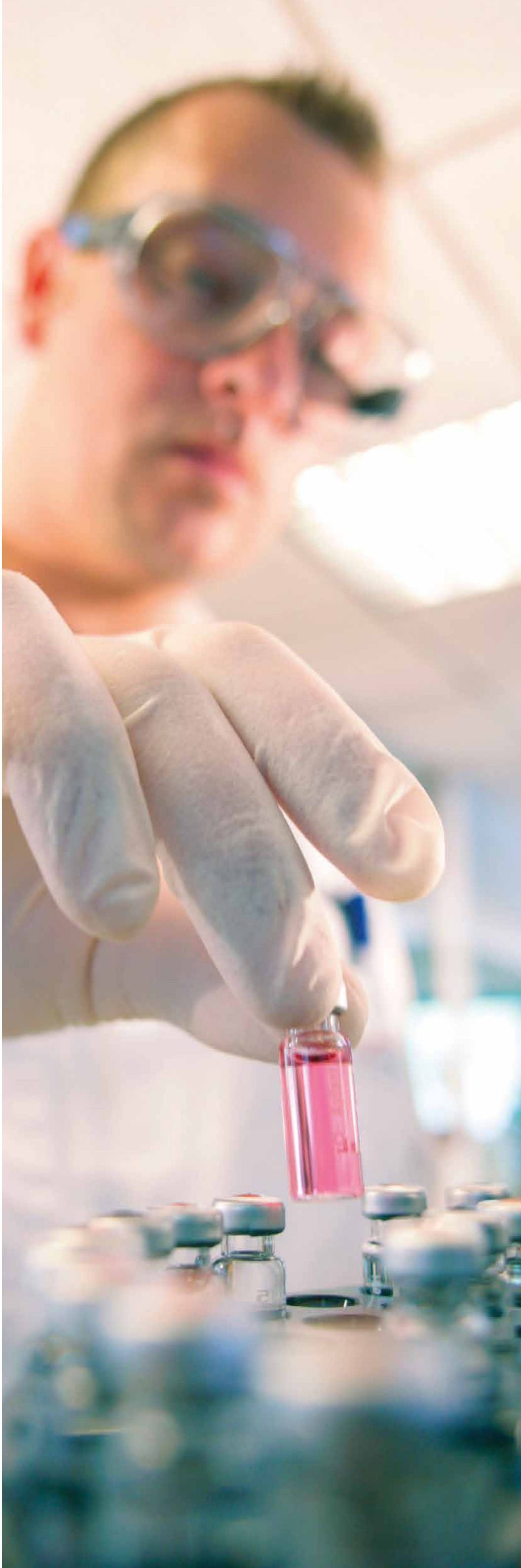
- Development of novel fermenter designs to increase fermentation efficiency and optimize process conditions

- Development of bioelectrochemical systems that use *in situ* generated H_2 and renewable electricity as the energy source

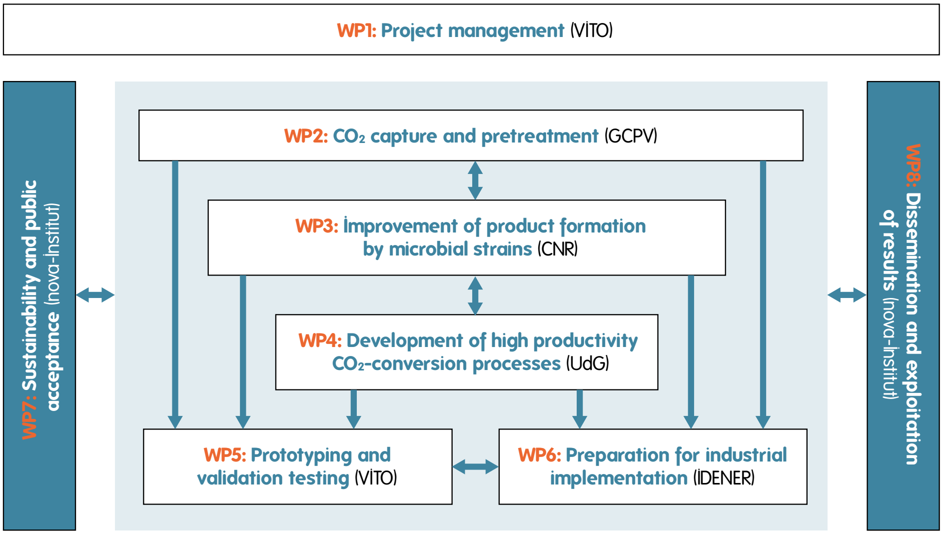
- Validation of the most promising isobutene and lactate production route at technology readiness level 5 on real off-gases

- Multidisciplinary design optimization and preparation for industrial implementation

- Techno-economic and sustainability assessment



Work packages of the BioRECO$_2$VER project



Project consortium

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