Microbial Electrolysis Cells integration in anaerobic digesters for biogas upgrading.

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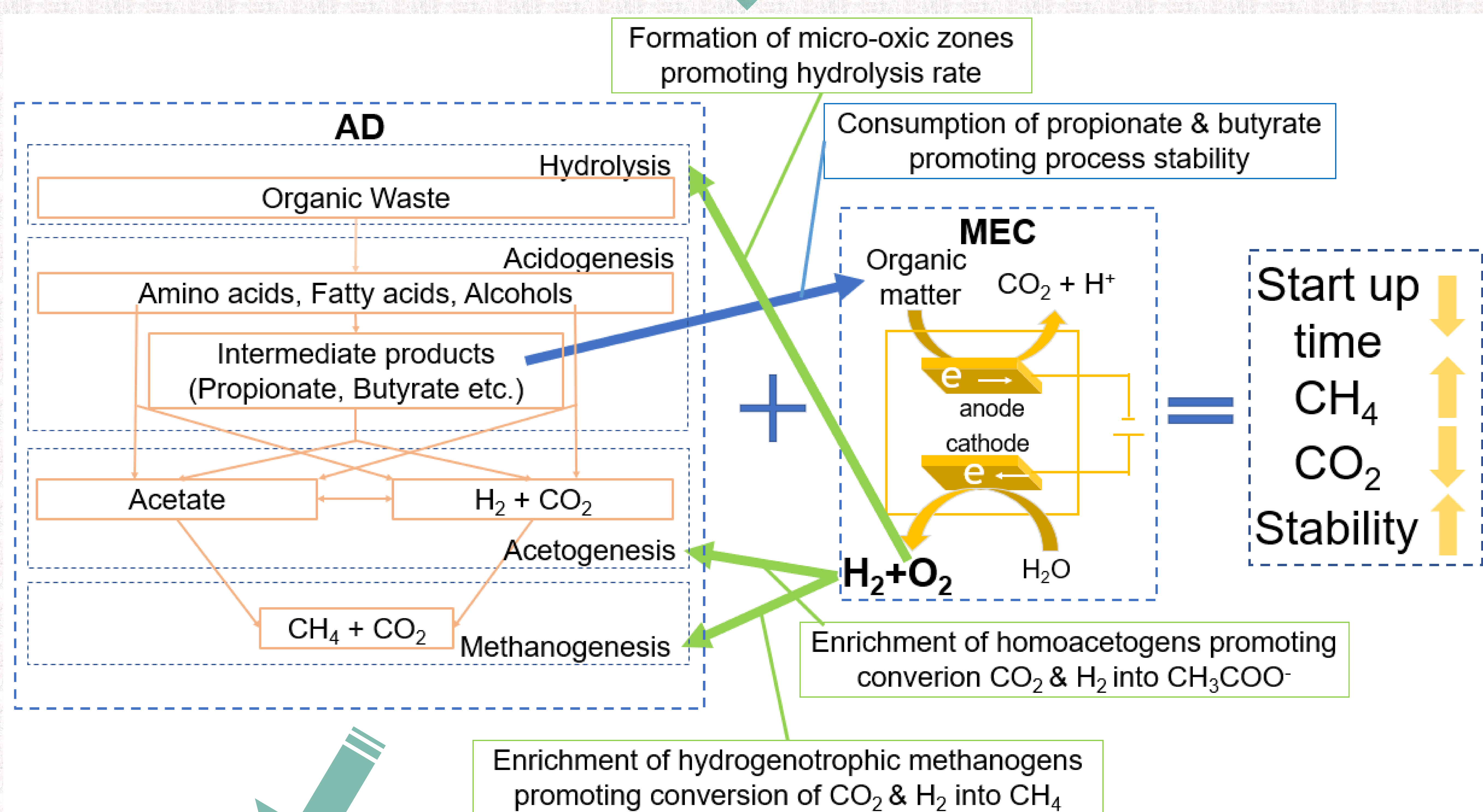
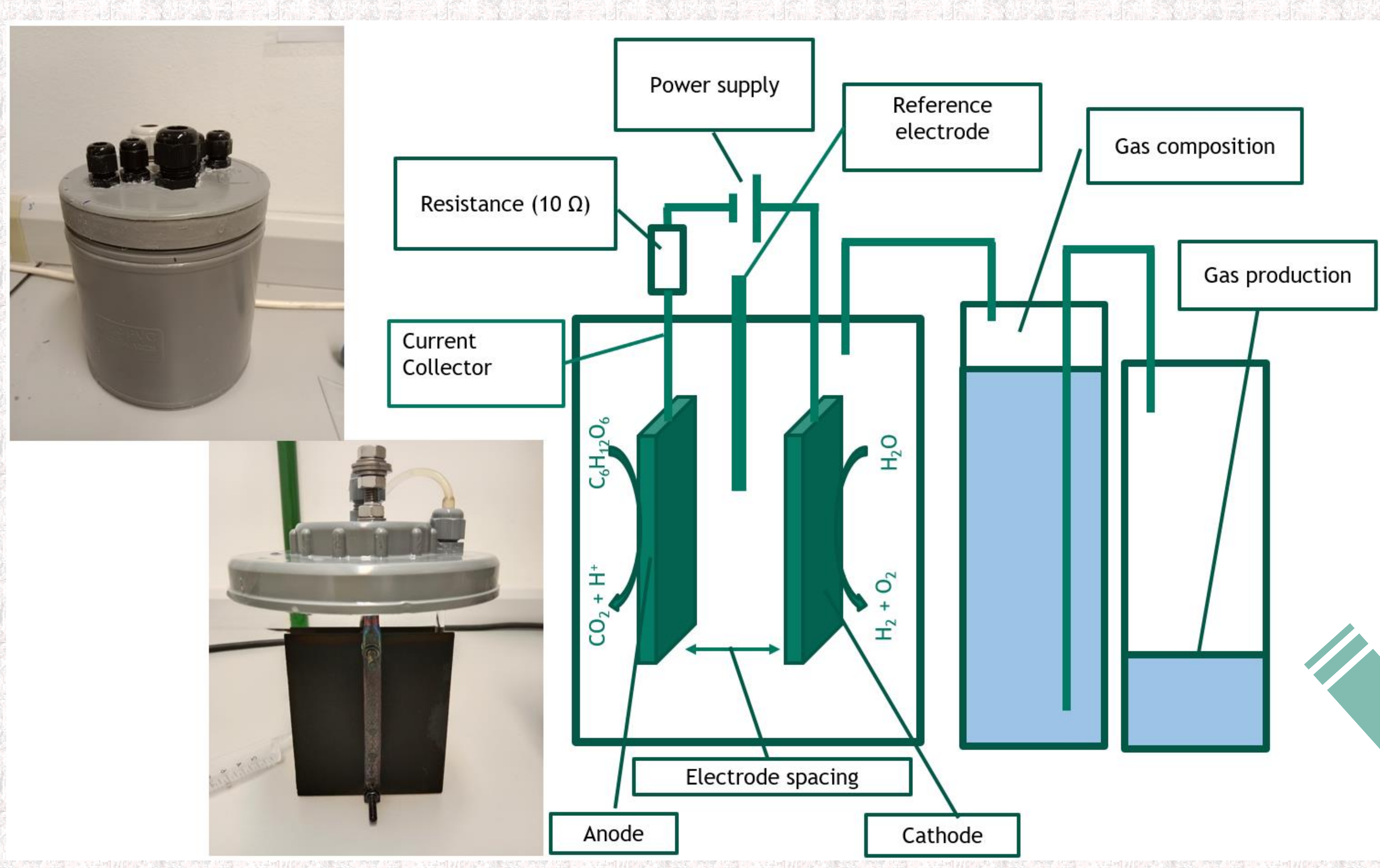
Introduction

Anaerobic digestion stands out as a promising technology for simultaneous waste treatment and bioenergy production. However, it faces challenges such as prolonged start-up times, low methane content, and susceptibility to environmental fluctuations. Addressing these bottlenecks is crucial for advancing the field. The integration of Microbial Electrolysis Cells (MECs) into anaerobic digestion (AD) systems emerges as an innovative approach for sustainable waste treatment and renewable energy production, offering solutions to conventional anaerobic digestion challenges



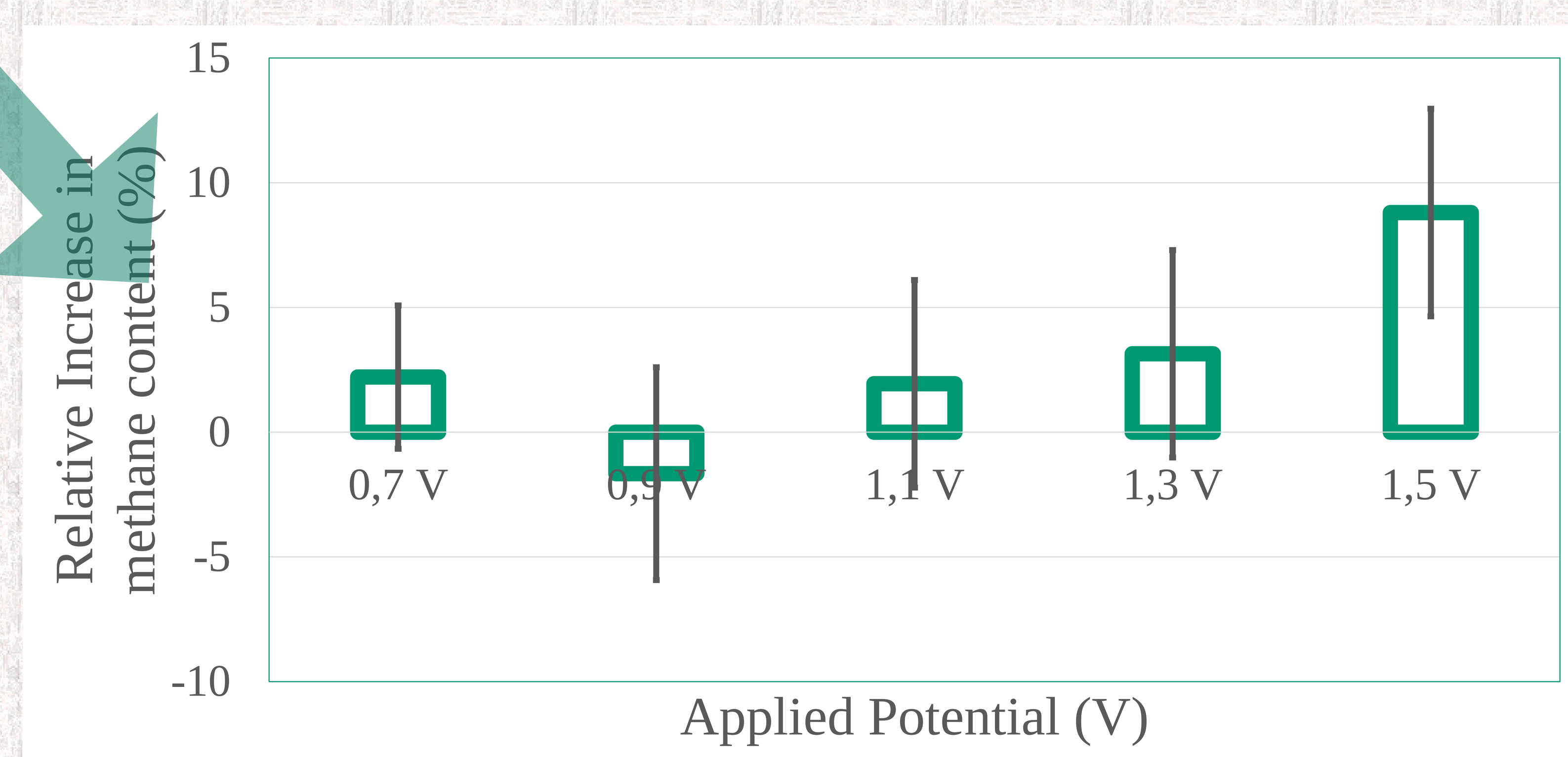
Materials & Methods



The present work, developed within the framework of the **CRONUS** project, tested applied potentials of 0.7, 0.9, 1.1, 1,3 and 1,5 V with glucose as substrate and a MEC with a graphite plate anode and cathode (40 x 80 x 2 mm) in a polyvinyl chloride (PVC) reactor. To determine the effect on the composition the concentration of methane, carbon dioxide and hydrogen were measured. The relative increase in methane content was calculated by taking the difference between the AD-MEC and the AD and dividing this by the percentage of methane measured in the AD set-up.

Results & Discussion

The relative methane content of the biogas produced by the AD-MEC set-up increased from – 1.4% at an applied potential of 0.9 V to 8.8% at an applied potential of 1.5 V. It is highly likely that this can be attributed to accelerated formation of H_2 at 1.5V compared to 0.9 V. The accelerated H_2 formation results in an enhanced availability of H_2 for hydrogenotrophic methanogenesis and stimulates biological CO_2 methanation, in agreement with literature.



Conclusions

An applied potential of 1.5 V results in a relative increase in methane content of 8.8%. This result shows that integration of a MEC can increase the methane content of the produced biogas. And, therefore confirms the promise MEC integration in AD for performance enhancement.

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