H_2 production via electrochemical reforming of alcohols

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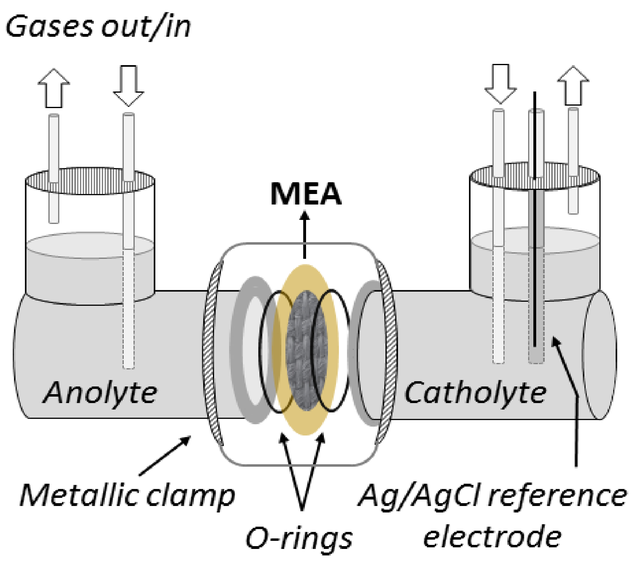
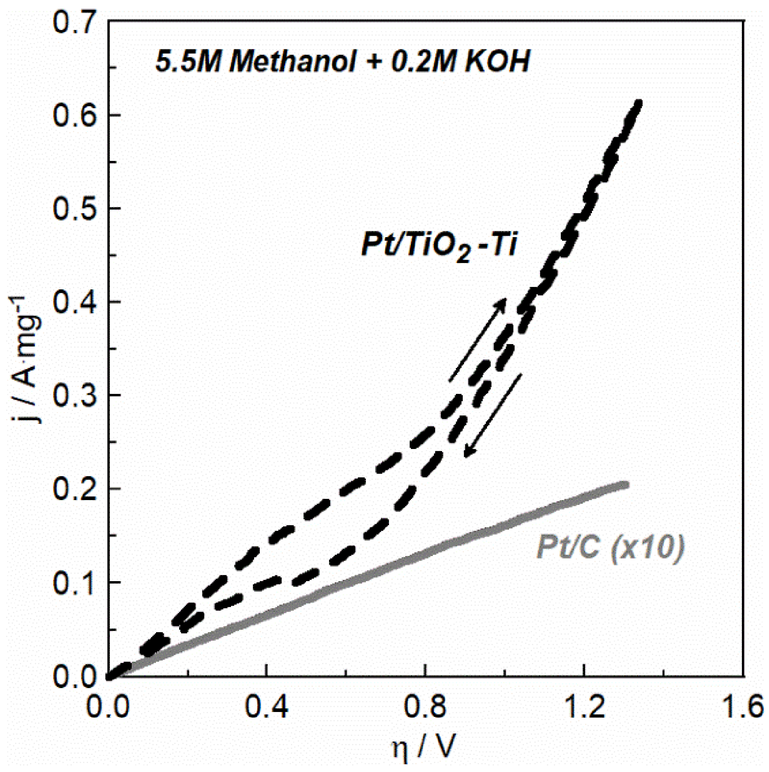
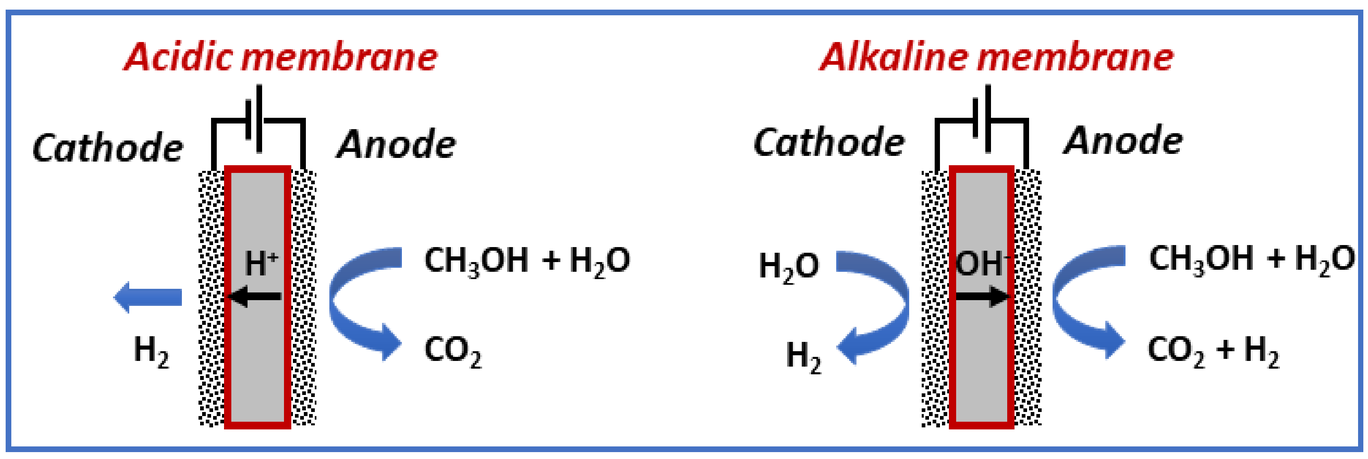
Alcohol electrolysis or electrochemical reforming of alcohols :
An alternative approach for H2 production with low power demands

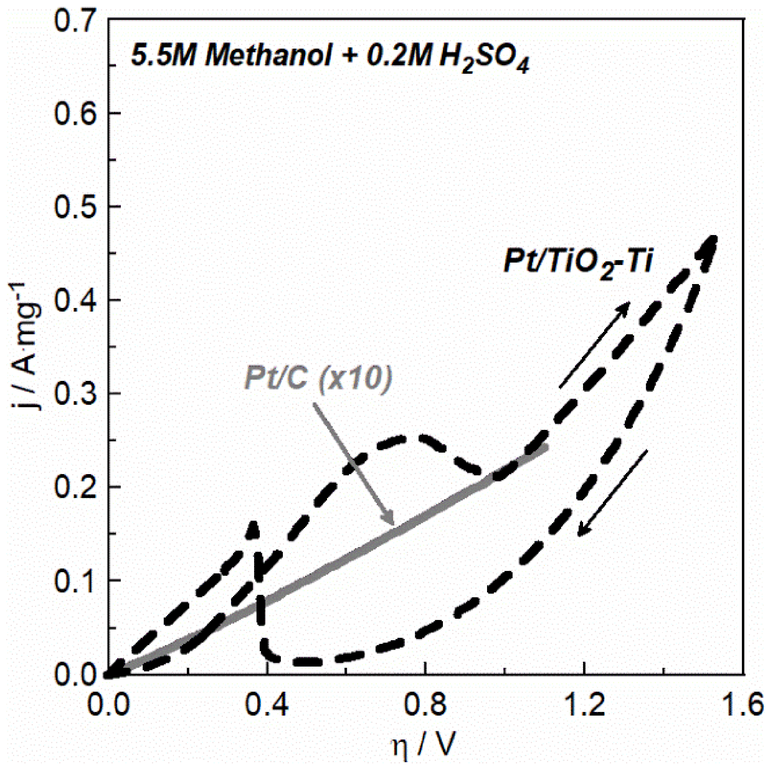
The aim of the present study is to identify promising **membrane-electrode-assemblies** (MEAs) which can enable **cost-effective and efficient alcohol electrolysis**. Our investigations were focused on (i) properly selecting the **polymeric electrolyte** and (ii) designing **novel gas-diffusion electrodes**



A standard Ag/AgCl reference electrode allows for monitoring the anodic and cathodic overpotentials.
Ohmic overpotential was quantified via Electrochemical Impedance Spectroscopy.

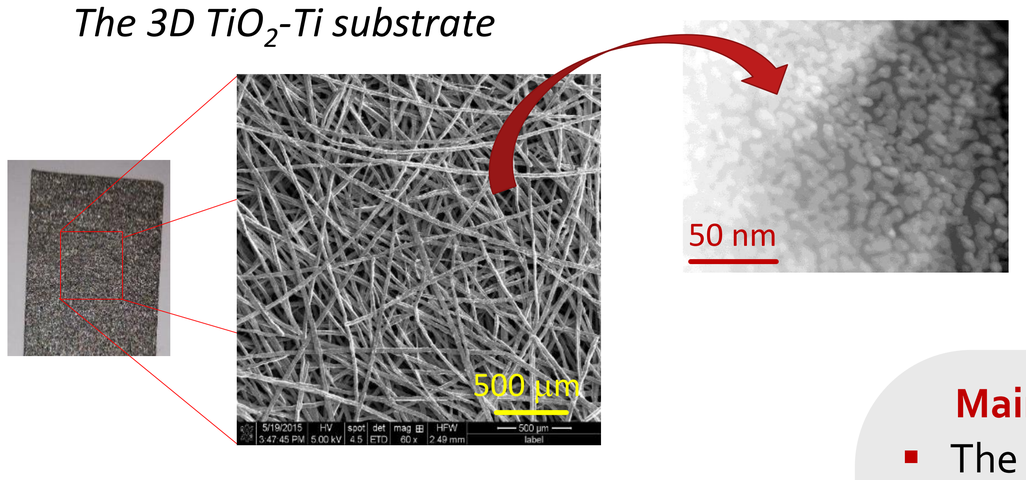






100 ALD cycles Pt deposition

The 3D TiO_2-Ti substrate



Main findings:

- The anodic overpotential (alcohol electrooxidation half-reaction) is much lower in alkaline than in acid environment.
- Alcohol electrolysers can be more efficient with OH- conducting membranes under appropriate operation conditions (high pH in anolyte solution) in order to minimize ohmic losses.
- Novel anodes were developed by Atomic layer Deposition (ALD) of Pt on a porous TiO2-Ti substrate.
- The developmental anodes can show up to 30 times higher performance compared to commercial Pt/C anodes.
- The superior performance is due to induced metal-support interactions and optimized structural characteristics.

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