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New Anion Exchange Membrane Electrolysers

GRANT AGREEMENT No. 875024

Anion Exchange Membrane Electrolysis for Renewable Hydrogen Production on a Wide-Scale

ANIONE – Public deliverable Report

D5.3 – Publishable report on MEA assessment

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Summary and conclusion

An efficient electrolysis MEA based on an AEM membrane and catalysts free of CRM & PGM has been developed. The reported initial MEA screening analyses have been carried out at CNR-ITAE. The information and results have been transferred to IRD in order to scale-up the selected formulations for large scale coating. Among the CRM-free cathodes, the NiMo/KB catalyst showed the best performance in the AEM electrolysis cell achieving a current density of 1 A cm^{-2} at about 1.7-1.8 V/cell when it was used in combination with a NiFe-oxide anode and a 50 µm thick Fumatech FAA-3-50® hydrocarbon membrane. Some effort has been spent on mapping out optimal operational conditions e.g., the effect of recirculation through the cell of a diluted KOH solution has been investigated. A concentration of 0.5-1 M KOH appeared necessary to achieve suitable performance at high current density. The developed materials showed proper performance also in the case of diluted KOH concentration in particular in the presence of a 0.5 M KOH solution recirculated through the cell. A further decrease of KOH concentration to 0.1 M or pure water caused a large increase of polarisation resistance indicating a relevant role of the hydroxide ion concentration on the electrocatalytic properties. Durability tests showed an initial decrease of cell voltage with time during 2,000 h operation at 1 A cm^{-2} until reaching a steady state performance with an energy efficiency close to 80%. An increase of reversible losses during start-up and shutdown cycles was observed. Appropriate stability was observed during cycled operation between 0.2 and 1 A cm^{-2}; however, the voltage efficiency was slightly lower than in steady-state operation due to the occurrence of reversible losses during the cycles.

Table of Content

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Project partnes:

#	Partner	Partner Full Name
1	CNR-ITAE	CONSIGLIO NAZIONALE DELLE RICERCHE
2	CNRS	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE
2.1	UM	UNIVERSITE DE MONTPELLIER
3	HydroLite (formerly PoCellTech)	HYDROLITE
4	TFP	TFP Hydrogen Products (former PV3 TECHNOLOGIES LTD)
5	IRD	IRD FUEL CELLS A/S
6	HYDROGENICS	HYDROGENICS EUROPE NV
7	UNR	UNIRESEARCH BV

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