Hydrogen Europe:
European Hydrogen & Fuel cell Project Database

Project ELECTRA

High temperature electrolyser with novel proton ceramic tubular modules of superior efficiency, robustness, and lifetime economy

High temperature electrolysers (HTEs) produce H2 efficiently utilising electricity from renewable sources and steam from solar, geothermal, or nuclear plants. CO2 can be co-electrolysed to produce syngas and fuels. The traditional solid oxide electrolyser cell (SOEC) leaves wet H2 at the steam side. ELECTRA in contrast develops a proton ceramic electrolyser cell (PCEC) which pumps out and pressurises dry H2 directly. Delamination of electrodes due to O2 bubbles in SOECs is alleviated in PCECs. The proton conductor is based on state-of-the-art Y:BaZrO3 (BZY) using reactive sintering for dense large-grained films, low grain boundary resistance, and high stability and mechanical strength. A PCEC can favourably reduce CO2 to syngas in co-ionic mode. Existing HTEs utilise the high packing density of planar stacks, but the hot seal and vulnerability to single cell breakdown give high stack rejection rate and questionable durability and lifetime economy. ELECTRA uses instead tubular segmented cells, mounted in a novel module with cold seals that allows monitoring and replacement of individual tubes from the cold side. The tubes are developed along 3 design generations with increasing efforts and rewards towards electrochemical performance and sustainable mass scale production. Electrodes and electrolyte are applied using spraying/dipping and a novel solid state reactive sintering approach, facilitating sintering of BZY materials. ELECTRA emphasises development of H2O-O2 anode and its current collection. It will show a kW-size multi-tube module producing 250 L/h H2 and CO2 to syngas co-electrolysis with DME production. Partners excel in ceramic proton conductors, industry-scale ceramics, tubular electrochemical cells, and integration of these in renewable energy schemes including geothermal, wind and solar power. The project counts 7 partners (4 SMEs/industry), is coordinated by University of Oslo, and runs for 3 years.

Project Information

Type of project : Research
Timing : 03/03/2014 > 02/06/2017
Project website: http://www.mn.uio.no/smn/english/research/projects/chemistry/electra/index.html
Project Budget : 4.007.085 €

Funding

European Union through FCH JU: **Grant agreement 621244 - CORDIS link**

Project partners

Coordinator :
UNIVERSITETET I OSLO
Partners :
SINTEF AS
Abengoa Innovación
AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS
MARION TECHNOLOGIES S.A.
COORSTEK MEMBRANE SCIENCES AS
CRI EHF

Sub project(s)

Sub project 1

Country: Norway
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Sub project categories
Research

Project Id: 954
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