Multi-Dimensional Computer Simulation Code For Proton Exchange Membrane (Pem) Electrolysis Cell (Ec) Advanced Design And Control

Tech ID: 33550 / UC Case 2024-968-0

CONTACT

Edward Hsieh
hsiehe5@uci.edu
tel: 949-824-8428.

INVENTORS

» Wang, Yun

OTHER INFORMATION

CATEGORIZED AS

» **Computer**
» Software
» **Energy**
» Other

RELATED CASES

2024-968-0

BRIEF DESCRIPTION

Polymer electrolyte membrane (PEM) electrolyzers have received increasing attention for renewable hydrogen production through water splitting. In order to develop such electrolyzers, it is necessary to understand and model the flow of liquids, gases, and ions through the PEM. An advancedmulti-dimensional multi-physics model is established for PEM electrolyzer to describe the two-phase flow, electron/proton transfer, mass transport, and water electrolysis kinetics.

SUGGESTED USES

·Design, optimization, and control for hydrogen PEM electrolyzers

FEATURES/BENEFITS

·First model that successfully models liquid and oxygen transport in the porous transport layer and catalyst layer in three-dimensional space

·Capable of predicting PEMEC performance, O2 distribution, H2 distribution, water distribution, and reaction rate distribution inside a PEMEC

TECHNOLOGY DESCRIPTION

Renewable hydrogen is necessary to enable a transition to clean fossil-fuel free energy. An important method of producing clean hydrogen is electrolysis of water and one key component of such electrolyzers is the PEM.In order to commercially deploy electrolyzers it is necessary to design the appropriate configuration of the PEM.However, PEMs are difficult to model because complex fluid dynamics and chemical reactions depend on porosity, thickness, pore size, and other factors.This software allows for the accurate modeling of the porous transport layer and the channel-land structure of PEMs and thus allows manufacturers to design high-performance electrolyzers.

STATE OF DEVELOPMENT

-Code is based on user-defined-functions in ANSYS FLUENT and C

-Validated on three sets of independent experimental data

-Non-exclusive license negotiations in progress with industry leaders

-Professor is willing to provide support and guidance in application of the code

RELATED MATERIALS

» Two-dimensional multi-physics modeling of porous transport layer in polymer electrolyte membrane electrolyzer for water splitting - 11/27/2020

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5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683

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