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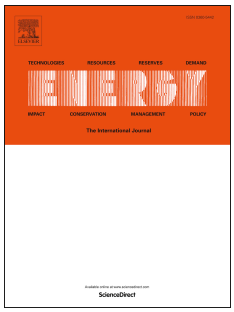

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PII: S0360-5442(18)31440-3

DOI: 10.1016/j.energy.2018.07.143

Reference: EGY 13408

To appear in: *Energy*

Received Date: 11 November 2017

Revised Date: 20 July 2018

Accepted Date: 21 July 2018

Please cite this article as: Chowdhury MZ, Timurkutluk B, Transport phenomena of convergent and divergent serpentine flow fields for PEMFC, *Energy* (2018), doi: 10.1016/j.energy.2018.07.143.

Transport phenomena of convergent and divergent serpentine flow fields for PEMFC

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ABSTRACT

Reactive species and water transport are crucial for the proton exchange membrane fuel cell operation and performance, and for this, effective flow field design can facilitate the desired transport characteristics of species. From this motivation, the conventional single serpentine flow field pattern is modified by convergent and divergent design concepts and the complex transport phenomena of the newly developed flow field designs are investigated by a numerical approach. For the numerical analyses, an experimentally validated mathematical model is developed to predict the current density, oxygen mass transport, water concentration and pressure distribution. The different configurations of modified convergent and divergent serpentine flow fields are then numerically solved and the results are compared with the conventional serpentine flow field pattern. The transport of reactive species and water concentration are analyzed from the different perspectives including cathode domains and surfaces with a quantitative formulation of the transport species. The numerical results