Mathematical modeling of solid oxide fuel cells: A review

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ABSTRACT

This paper presents a review of studies on mathematical modeling of solid oxide fuel cells (SOFCs) with respect to the tubular and planar configurations. In this work, both configurations are divided into five subsystems and the factors such as mass/energy/momentum transfer, diffusion through porous media, electrochemical reactions with and without CO oxidation, shift and reforming reactions, and polarization losses inside the subsystems are discussed. Using variety of fuels fed to SOFCs is issued and their effect on the system is compared briefly. A short review of solid oxide fuel cell configurations and different flow manifolding are also presented in this study. Novel models based on statistical data-driven approach existing in the literatures are considered shortly. Although many studies on solid oxide fuel cells modeling have been done, still more research needs to be done to improve the models in order to predict the fuel cell behaviors more accurately. At the end of this paper the works and studies that can be done for improving the fuel cell models is suggested and pointed by the authors.

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