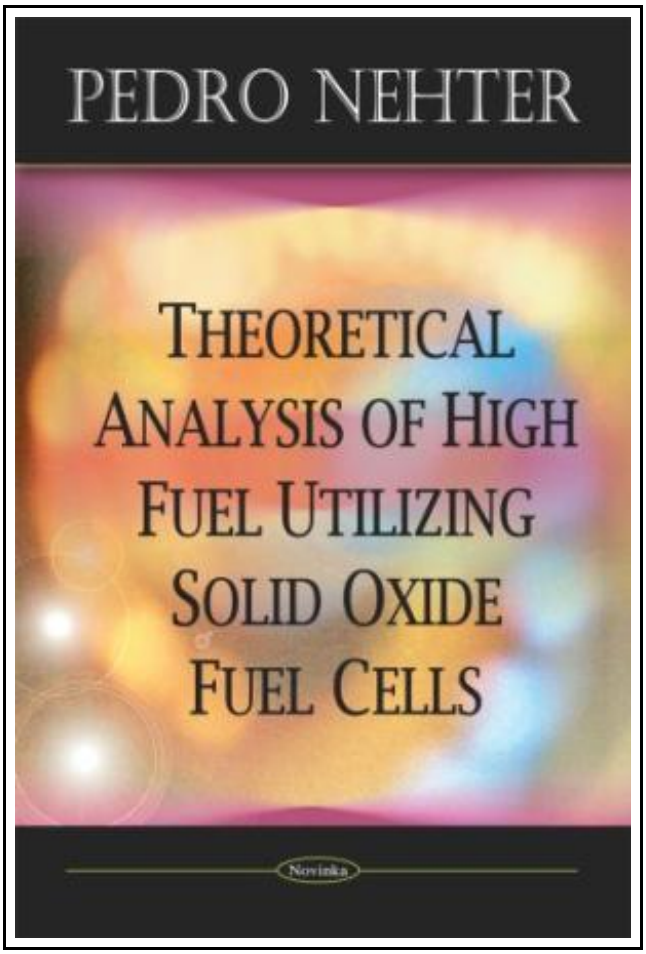
Theoretical Analysis of High Fuel Utilizing Solid Oxide Fuel Cells



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THEORETICAL ANALYSIS OF HIGH FUEL UTILIZING SOLID OXIDE FUEL CELLS

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Nova Science Publishers Inc. Paperback. Book Condition: new. BRAND NEW, Theoretical Analysis of High Fuel Utilizing Solid Oxide Fuel Cells, Pedro Nehter, The commercialisation of fuel cells needs further developments in materials, power density and durability. These key issues are strongly related to the choice of electrochemical, thermodynamic and design parameters. This applies in particular to the sensitivity of the solid oxide fuel cell's (SOFC's) power density and durability. Achieving high power density has to be assessed carefully with regard to the cell's voltage, fuel utilisation and efficiency. The operation at high fuel utilisation is particularly critical due to the decrement in the Nernst voltage and the formation of nickel oxide at nickel cermet anodes.Both effects are influenced by the local hydrogen to water ratio of the anode gas. Therefore, it is essential to understand the local resolution of the gas composition and its influence on the total power density. In this context, analytical solutions of the integral current density at a constant area specific resistance (ASR) are presented in this study. As a result of the transferred species, loss mechanisms occur. These polarisation losses are sensitively influenced by numerous mechanisms, which are strongly non-linear. Therefore, a finite difference model is chosen to analyse the influence of the major operational parameters on the power density. It is based on a two dimensional resolution of the local energy balance in the axial and radial direction of a tubular SOFC.This model includes heat transfer by conduction, convection and radiation as well as the heat sources due to the chemical and electrochemical reactions. The shift reaction and the reforming of residual methane are taken into account by a kinetic approach. The electrochemical losses of the hydrogen oxidation are determined by commonly used Butler-Volmer equation, binary diffusion, Knudsen diffusion and ohmic law. Based on...

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