

平板式SOFC结构热应力的有限元分析

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摘要

采用有限元数值计算方法, 对平板式固体氧化物燃料电池(SOFC)的结构建立了三维有限元分析模型, 模拟计算了平板式SOFC单电池在均匀温度场中由于各层部件之间的热膨胀系数差异而产生的热应力, 并对模拟结果进行了分析和讨论, 为优化平板式SOFC的材料选择和结构设计提供了依据. 计算结果表明: 在阳极(或阴极)与电解质界面处出现热应力的最大值; 界面热应力的大小及分布与电极材料的热膨胀系数和温度载荷密切相关.

关键词 [平板式SOFC](#) [有限元](#) [热膨胀系数](#) [热应力](#)

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Finite Element Analysis of Thermal Stresses in Planar SOFCs

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Abstract

Finite Element Analysis (FEA) method was adopted to establish the thermal/structure model for planar SOFC and simulate the distribution of thermal stress and displacement caused by a uniform temperature field as a consequence of coefficient of thermal expansion (CTE) mismatch among the SOFC component materials. The calculated results were analyzed and discussed, which can be used as the guide for the single cell materials selection and structure design. The calculations indicate that the maximum stress appears on the electrode/electrolyte interface; the value and distribution of the interface stress are the functions of electrode material CTEs and applied temperature field. FEA software ANSYS was employed, and according to the structural characteristics of the planar SOFC, the procedures of establishing model, defining nodals, applying load and calculating were performed.

Key words [planar SOFC](#) [finite element](#) [coefficient of thermal expansion](#) [thermal stress](#)

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