Theoretical Study on the Performance of PEMFCs

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ABSTRACT

The performance curve of a fuel cell represents the relationship between its operating voltage and current density. For fuel cell working at certain current, higher voltage indicates more power output, higher efficiency and hence better performance. It has long been the target of numerous researchers ’ effects to work out the way to make fuel cell with high efficiency, but at low cost. The main purpose of this study is to perform an investigation into the performance related problems with PEMFCs. There are a great number of parameters influencing the performance of a PEMFC. The physical parameters of its catalyst layer, gas diffusion layer, and proton exchange member, as well as the operating parameters, such as pressure, temperature, and composition, all have effects on the performance of a PEMFC. On account of this we can find that the behavior phenomenon of a PEMFC is a complex problem. It's very difficult to compare clearly the optimal parameter ’ s values in the PEMFC, due to the fact that a great number of parameters are involved in the problem. In this research, a dimensionless model approach of catalyst layer of a PEMFC cathode together with numerical simulation will be applied to investigate, in a direct way, the influence of the aforementioned parameters on the performance of PEMFCs. In the addition, the mechanisms of the activation overpotential and the limitingcurrent will also be studied. The results of this research will clarify the mechanisms relevant to the performance of PEMFCs and come up with some idea to enhance the performance of fuel cells.

Keywords : PEMFC, Cathodic overpotential, Mathematical modeling, Nondimensionalization, Performance curve

Table of Contents

封面內頁 簽名頁 授權書 .....iii 中文摘要..... v 英文摘要 .....vi 誌謝 .....viii 目錄 .....ix 圖目錄 .....xii 表目錄 .....xiv 符號說明..... xv 第一章 緒論..... 1 1.1 前言..... 1 1.2 燃料電池簡介..... 3 1.2.1 燃料電池工作原理 .....3 1.2.2 燃料電池的種類與特性..... 4 1.3 文獻回顧 .....8 1.4 研究動機與目的 .....12 第二章 研究方法 .....14 2.1 質子交換膜燃料電池的基本原理與反應機制 ....14 2.1.1 質子交換膜燃料電池之結構 .....14 2.1.2 質子交換膜燃料電池之原理 .....16 2.1.3 質子交換膜燃料電池的性能特徵 .....18 2.1.4 影響質子交換膜燃料電池性能之因素 .....21 2.2 陰極觸媒層模型..... 25 2.3 陰極氣體擴散層模型 .....28 2.4 陰極觸媒層與氣體擴散層數學模型之整合 .....30 2.4.1 陰極觸媒層部份 .....30 2.4.2 陰極氣體擴散層部份 .....32 2.4.3 數值解部份 .....33 2.5 分析方法 .....34 2.5.1 陰極活化過電位之探討 .....34 2.5.2 陰極極限電流之探討 .....35 第三章 結果與討論 .....37 3.1 各項參數對PEMFC 性能之影響 .....38 3.1.1 不同陰極觸媒層氧氣擴散係數 .....39 3.1.2 不同陰極氣體擴散層氧氣擴散係數 .....39 3.1.3 不同陰極觸媒層中離子聚合物之有效導電係數 40 3.1.4 不同觸媒單位活化面積 .....40 3.1.5 不同陰極氣體擴散層厚度 .....41 3.1.6 不同陰極觸媒層厚度 .....41 3.2 高效能觸媒層之PEMFC 性能 .....42 3.2.1 高效能觸媒層下不同觸媒層厚度 .....42 3.2.2 高效能觸媒層下不同觸媒活化面積 .....42 3.3 不同氧氣擴散係數對極限電流之敏感度 .....43 3.4 不同π、b值下對活化過電位之影響 .....44 3.5 不同陰極反應氣體壓力與氣體擴散層孔隙率 ....46 第四章 結論與建議 .....47 參考文獻 .....49 附錄A Tafel 公式推導與交換電流密度影響因素 78

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