

可再生能源发电

空冷型质子交换膜燃料电池堆温湿度特性自适应模糊建模与输出控制

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摘要: 空冷型质子交换膜燃料电池 (air-cooling proton exchange membrane fuel cell, PEMFC) 堆具有结构简单, 系统自身能耗低等特点, 在便携式电源研究方面有良好的应用前景。以移动机器人作为供电对象, 通过实验获得最优性能输出下的最佳电堆工作温度和尾气排放周期变化规律, 应用自适应模糊辨识方法建立电堆温湿度特性模型, 并针对负载变化特点, 采用自适应模糊控制方法设计电堆温度和湿度控制器, 在满足系统稳态和动态性能基础上, 获得最优性能输出。

关键词: 空冷型质子交换膜燃料电池堆 温湿度特性 自适应模糊辨识 自适应模糊控制

Temperature-humidity Characteristics Modeling and Output Control Based on Adaptive Fuzzy Method for Proton Exchange Membrane Fuel Cell Stack

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Abstract: Air-cooling proton exchange membrane fuel cell (PEMFC) possesses some advantages, such as simpler structure, lower energy consumption and so on, it has emerged as a potential application for the portable power source. PEMFC stack was used as the power supply of autonomous robots, and lots of experiments were designed to obtain the variation rules of optimal operation temperature and exhaust cycle with optimal output performance. Then, the temperature and humidity characteristic models based on adaptive fuzzy identification algorithm were established, and adaptive fuzzy control method was applied to design the controllers according to the load characteristic. Finally, the results show that the dynamic and stable performance of the control system is satisfying, and the optimal performance output can be obtained.

Keywords: air-cooling proton exchange membrane fuel cell stack temperature-humidity characteristic adaptive fuzzy identification adaptive fuzzy control

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