

The development of an exchangeable PEMFC power module for electric vehicles

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Abstract

This paper develops an exchangeable fuel-cell power module that is replaceable on different light electric vehicles (LEVs). The module consists of a proton exchange membrane fuel-cell (PEMFC) and two battery sets, which provide continuous power for LEVs. The study includes three topics: fuel-cell control, power management, and system modularization and vehicle integration. First, we design robust controllers for the PEMFC to provide a steady voltage or current for charging the battery sets. Second, we develop a serial power train that can provide continuous power for driving the vehicle motors. Third, we modularize a power system that can be easily implemented on different LEVs. We build the system on Matlab™ SimPowerSystem for simulation before road tests, and integrate the power module onto a mobility car and an electric motorbike for experimental verification. Based on the results, the proposed systems are deemed effective.