Robust control of interleaved boost converter for open-cathode PEM fuel cell systems

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ABSTRACT
This paper implements a thermal control and a super-twisting sliding mode (STSM) incorporated with an interleaved boost converter (IBC) for an open-cathode proton exchange membrane fuel cell (OC-PEMFC). The implementation of the thermal control is to regulate the stack temperature and adjust the air stoichiometric during the fuel cell current variation. The STSM controller is designed to ensure the fuel cell system's robustness by achieving the reference values set. Therefore, simulation results discussed that the thermal control provides the suitable stack temperature to the system and maintains the fan voltage during temperature variations. A PI controller is designed and used as a comparison to the proposed STSM controller. Hence, the proposed STSM demonstrates its effectiveness in tracking down the reference current values for the fuel cell system.

KEYWORDS
Robust control; PI control; Simulation; Fuel cells; Robustness; Stability analysis; Temperature control

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