

Start-up procedures on single PEM fuel cell level

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Polymer electrolyte membrane fuel cells (PEM FCs) are expected to gradually replace internal combustion engines as electrical power sources due to high efficiency and environmental sustainability. However, during real automotive conditions, particularly during start/stop, its membrane electrode assembly is prone to degradation, resulting in a loss of overall performance, consequently limiting durability of PEM FCs. For successful commercialization, it is of significant importance to simultaneously optimize the start-up strategy and enhance the power generation performance of PEM FC in mobile applications.

Herein, a class of current controlled protocol is proposed, evaluated and optimized for start-up of a 25 cm² single PEM FC. During separate stress tests, one adopting a linear current course and another using a multi-stage current course, the cell is subjected to repeated starts and its performance is monitored in-situ (Fig. 1). Furthermore, ex-situ microscopy analysis and online off-gas analysis reveal indication of membrane and catalyst layer degradation, as expected.

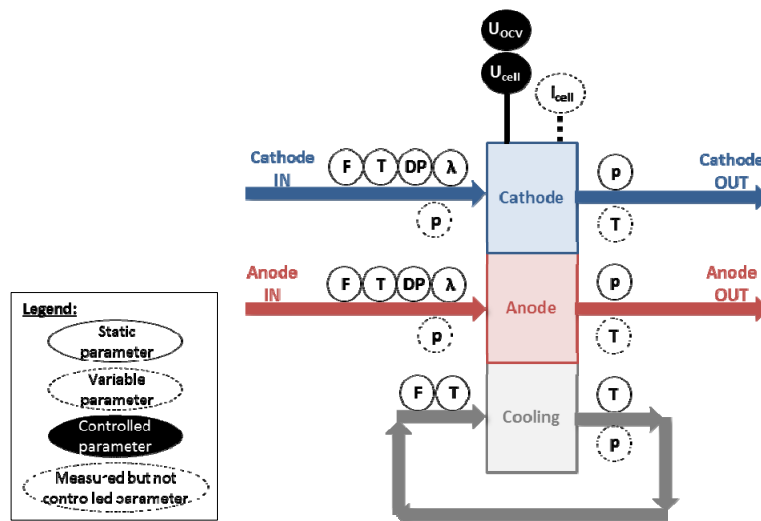


Figure 1 General set-up for start testing using a single PEM FC.