

## Rule-Based Mamdani Type Fuzzy Modeling of Performances of Anode Side of Proton Exchange Membrane Fuel Cell Spin-Coated with Yttria-Stabilized Zirconia

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**Abstract :** In this study, performance of proton exchange membrane (PEM) fuel cell was experimentally investigated and modelled with Rule-Based Mamdani-Type Fuzzy (RBMTF) modelling technique. Coating on the anode side of the PEM fuel cell was accomplished with the spin method by using Yttria-stabilized zirconia (YSZ). Input parameters voltage density (V/cm<sup>2</sup>), and current density (A/cm<sup>2</sup>), temperature (°C), time (s); output parameter power density (W/cm<sup>2</sup>) were described by RBMTF if-then rules. Numerical parameters of input and output variables were fuzzificated as linguistic variables: Very Very Low (L1), Very Low (L2), Low (L3), Negative Medium (L4), Medium (L5), Positive Medium (L6), High (L7), Very High (L8) and Very Very High (L9) linguistic classes. The comparison between experimental data and RBMTF is done by using statistical methods like absolute fraction of variance (R2). The actual values and RBMTF results indicated that RBMTF can be successfully used for the analysis of performance of PEM fuel cell.

**Keywords :** proton exchange membrane (PEM), fuel cell, rule-based Mamdani-type fuzzy (RMBTF) modeling, yttria-stabilized zirconia (YSZ)

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