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THE IMPEDANCE BASED FUZZY LOGIC CONTROL FOR THE CATHODE AIR FLOW OF A DIRECT METHANOL FUEL CELL SYSTEM

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Abstract. *In this study, a control strategy for direct methanol fuel cell (DMFC) systems is presented. By utilizing the specific impedance measurement, high frequency resistance (HFR) and charge transfer resistance (CTR), as the linguistic variable, this control strategy, based on the fuzzy logic, can distinguish the humidification conditions in a stack. Thus, with the efficient computation of the fuzzy controller, the stoichiometric flow for the air supply of the DMFC is varied to prevent the performance drops caused by flooding and drying. It is sufficient to assist the stack in reacting at an optimal operating state. Furthermore, this methodology reduces the measuring time of impedance and can real-time control the behaviors of a practical DMFC system. Although the influences of operating temperature on the state of system are not accounted, this fuzzy controller has the adaptability to run even if the stack is operated at various temperatures.*
Keywords: Direct methanol fuel cell (DMFC), High frequency resistance (HFR), Charge transfer resistance (CTR), Fuzzy logic

1. **Introduction.** The direct methanol fuel cell (DMFC) represents a promising technology for portable power applications because of the unique such as easy storage of fuel, a low operating temperature, and a high energy density [1-5]. Differing from the rechargeable batteries, a DMFC system needs an actively control to supply the reaction fuel. One of the most important problems in the performance control of DMFC systems is the water flooding in the cathode side. Since the liquid methanol solution is used as the fuel, the water possibly crossover through the membrane to cathode. Moreover, the water vapor resulted from the cathode ORR will condense in the cathode side. The excess water will block the gas transport in the cathode electrode, gas diffusion layer, and gas channels and then provoke the cell performance drop. For preventing the water flooding,