

The Advanced Study of Fuel Cross-over Using Methanol and Formic Acid as a Fuel

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In this study, we present experimental results and analysis of fuel cross-over on the various operating conditions using formic acid and methanol as a fuel in direct liquid feed fuel cells. To estimate the fuel cross-over we detect CO₂ from cathode effluent gas using gas chromatograph (GC), all detected CO₂ gas is regarded to permeated fuel from anode to cathode.

Generally, the fuel cross-over is induced across to membrane by diffusion, therefore with increasing current density the fuel cross-over is decreased. However, interestingly in this experimental result, the fuel cross-over has a interval of increasing with current-density, e.g., in DFAFC formic acid cross-over is decreased up to from 1.0 to 2.0 ampere and increased again higher current density. Futhermore in DMFC at a above 3 M methanol solution the methanol cross-over is increased from OCV state to higher current density without a interval of degradation.

We have tried to account for the cause of this phenomena and therefore to fulfill these needs we did additional experiments and have developed a mathematical model.