

A Decline in Fuel Cell Performance Resulting from Fuel Containing Impurities –3rd Report–

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In this paper, our investigation concerning the adverse effect on electricity generation performance of a FC, which is caused by using hydrogen fuel with many impurities contained within it, has been discussed. The results obtained are summarized below.

- 1) Actual values related to the concentrations and types of constituents of the gas generated by a methanol reformer, when using the steam reforming and auto thermal reforming approaches, were obtained.
- 2) Attention was focused on CO, CH₄, HCHO and HCOOH within the impurities of methanol reforming gas. Investigations were carried out in order to provide a more thorough understanding of the extent of their detrimental influence on the electricity generation performance of the FC, and the results are summarized below. a) An investigation was carried out concerning a poisoning estimation formula that aims to provide an understanding of the specific amount of deterioration in FC electricity generation performance caused by different impurities. By adopting both an estimation formula that focuses on the amount of adsorption of impurities onto the catalyst, and a poisoning coefficient concept that indicates the extent of poisoning, a new method for evaluating poisoning amounts was proposed. b) With regard to CO poisoning, the severity of the adverse effect caused by the estimated concentration of CO in fuel gas (50 to 100ppm) that is generated by present-day reformers, was confirmed. c) It has been made fully apparent that the adverse effect on electricity generation performance caused by adsorption of CH₄ onto the catalyst electrode is negligible, and can therefore be ignored. d) It has been established that there is an adverse effect on electricity generation performance caused by HCHO poisoning and HCOOH poisoning, and that the respective poisoning coefficients values are about 0.1 times and about 0.004 times that of CO.