

BF21

Effect of Platinum Particle Size on Electrolytic Activity
of Platinum-Dispersed Carbon Electrode
for Phosphoric Acid Fuel Cell(PAFC)

인산형 연료전지용 백금 분산된 탄소전극의 촉매활성도에
미치는 백금 입자 크기의 영향에 관한 연구

이 승 복, 변 수 일, 오 승 진

Department of Materials Science and Engineering,
Korea Advanced Institute of Science and Technology,
373-1 Kusung-Dong, Yusong-Gu, Daejeon 305-701, Korea

Effect of platinum particle size on the loss in electrocatalytic activity of platinum dispersed carbon (Pt/C) electrode has been investigated in view of surface group formation in 85% H_3PO_4 solution at $145^\circ C$ by using X-ray diffractometry(XRD), Fourier transform infra-red(FTIR) spectroscopy, potentiostatic current transient technique and ac-impedance spectroscopy. Average particle size of platinum was controlled by heat treatment under argon atmosphere for various hours and then determined from XRD analysis based on Scherrer's equation. In exploring the role of surface group in the electrocatalytic aspect of the electrode, FTIR spectroscopy was performed in order to investigate variation in amount of surface group with applied potential. From the results of FTIR spectra, it was shown that the main constituent of surface group is identified to be carboxyl group, and that formation potential of carboxyl group lies between 600 and 700 mV_{RHE}. It is suggested that formation of carboxyl group around catalyst gives rise to dead active surface area. From the potentiostatic current transients and ac-impedance spectra, a measure for the fraction of dead active surface area in total active surface area was evaluated. This experimentally-evaluated fraction of dead active surface area in total active area was compared with that theoretically calculated by assuming that all catalyst particles hold spherical symmetry and oxygen reduction rate is related to the active surface area of catalyst particle. These experimental results have been discussed in terms of the electrocatalytic activity depending on catalyst particle size.

References

1. K. Kinoshita and J. A. Bett, Carbon, 12 (1974) 525/533.
2. S.-I. Pyun and Y.-G. Ryu, J. Power Sources, 62 (1996) 1/7.
3. S.-I. Pyun, S.-B. Lee and S.-J. Orr, manuscript in preparation for publication in Carbon (1998).