Application of Mesoporous Carbon Nano Dendrites (MCND) as catalyst supporting materials for PEFCs

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Introduction

From the view point of commercialization of PEFCs, it is needed decreasing of Pt usage. In terms of catalyst support, to develop gas diffusion and high surface area and so on are more important.

Then, we focus on dendrite structure materials. It can have good gas diffusion ability. Therefore, we used unique carbon products, Mesoporous Carbon Nano Dendrites (MCND) to application for support materials of PEFCs. We used MCND (ESCARBON®-MCND) distributed by NIPPON STEEL & SUMIKIN CHEMICAL CO., LTD. This feature of material is dendrite structure, ultra-thin graphitic walls, relatively higher surface area. Thus, effective usage of Pt can be achieved. We checked characterization of MCND, then, we also confirmed its performance as catalyst support materials for PEFCs.

Experimental

MCND is synthesized by described elsewhere[1]. The characterization of this material is carried out by using TEM, SEM, XRD, TG-DTA, N_2 adsorption and Raman spectroscopy. In order to check performance of this for catalyst support material, we made Membrane Electrode Assembly; MEA. Then, we checked I-V performances and durability by potential cycling.

Results and Discussion

Figure 1 shows SEM image of synthesized MCND. The dendrite structure was obtained. Table 1 shows BET surface area of MCND and conventional Ketjen Black. MCND has 200 m^2/g higher surface area than Ketjen Black. Figure 2 shows TEM images of MCND and Pt loaded MCND (Pt/MCND). The loading of Pt is successfully prepared because of high surface area.

Figure 3 shows I-V performances of Pt loaded MCND (Pt/MCND) and Pt loaded Kejchen Black(Pt/KB). From this result, in the case of MCND, it was confirmed that the performance of high current density is improved because its dendrite structure. This result indicates it can be achieved to decrease of Pt usage in PEFCs.

In presentation, we also show the strategy to improve the durability of MCND.

References

[1]S. Numao, K. Judai, J. Nishijyo, K. Mizuuchi, N. Nishi *Carbon* **47** 306-312 (2009).

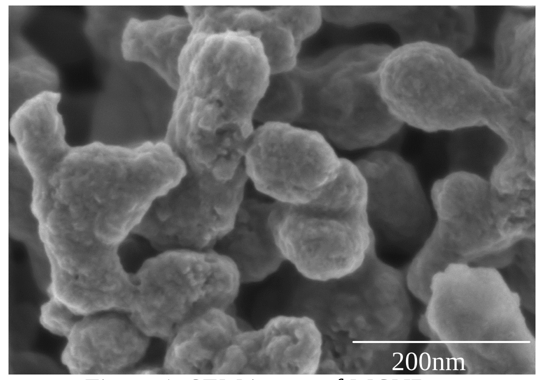

Figure 1. SEM image of MCND.

Table 1 BET surface area of MCND

	BET surface area(m^2/g)
MCND	1500
Ketjen Black	1300

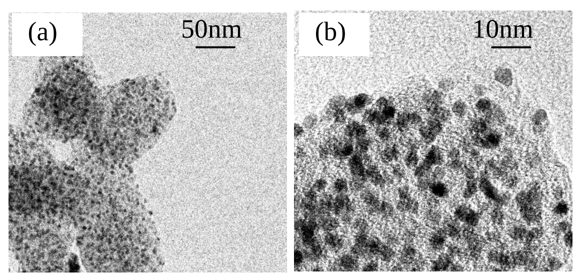

Figure 2. TEM images of Pt/MCND. (a) low magnification image (b) high magnification image.

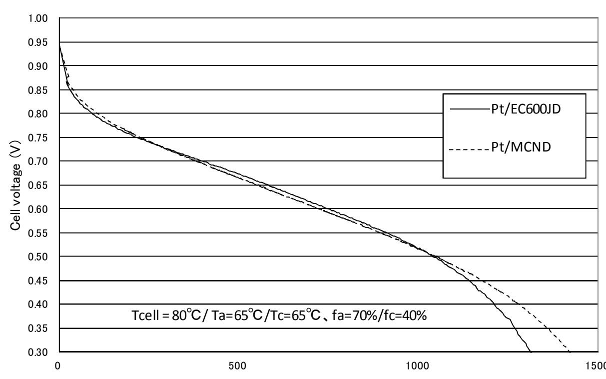

Figure 3. I-V performances of Pt/MCND and Pt/KB.