1. Introduction
One of the main problems facing the development of DMFCs is methanol crossover (MCO), this phenomena limits methanol concentration used in the cell till about 2M. A novel DMFC using porous carbon support has shown the possibility of using higher methanol concentration, suggesting that porous carbon support played a role in reducing MCO. This study has been carried out to understand the unique properties of this cell, focusing on MCO at open cell voltage conditions. \( \text{CO}_2 \) production rate, water and methanol fluxes were measured using different porous materials and factors affecting MCO were discussed.

2. Experimental
Two different porous carbon plates PCPY and PCPS, and ceramic material CER, were used in this study. Properties of these porous materials e.g. pore structure and water absorbivity were measured. Preparation of the porous materials, MEA fabrication procedures and apparatus used in the measurements were described in our previous reports\[^{1,2}\]. \( \text{CO}_2 \) was measured by CO\(_2\) meter, methanol and water flux were determined by measuring initial and final concentration and weight of methanol solution.

3. Results and discussion
Figure 1 shows the difference in \( \text{CO}_2 \) production rate for conventional MEA and MEA with different porous materials, it is clear that the using of porous material reduced \( \text{CO}_2 \) production rate largely from the conventional MEA. The porous materials controlled the diffusion of methanol from anode to cathode where, in case of MEA with different porous materials, \( \text{CO}_2 \) production rate was nearly constant with time but, in case of conventional MEA, \( \text{CO}_2 \) production rate was high at first then decreased with time. We noticed that \( \text{CO}_2 \) production rate only gives an indication to MCO but not express all the amount of methanol diffused from anode to cathode because a small part of methanol was not oxidized. Figure 2 shows that both of methanol and water fluxes were different for different porous materials and methanol flux was low in case of all porous materials than that in case of conventional MEA. From these two figures it is clear that porous plate reduces MCO. The degree of reduction in MCO was dependent on the properties of the porous materials.

Reference
2) N. Nakagawa, et al., 207\(^{th}\) Meeting of ECS, 778, 2005.

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