High Performance Fuel Cell Electrodes using Solid-phase Synthesized Carbon Nanostructured Materials

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We report on the synthesis of new carbon nanostructured materials including hollow carbon nanoparticles[2] (Fig. 1) and carbon nanocoils (Fig. 2)[1,3] and their successful applications to fuel cell electrodes. These carbon nanostructured materials were synthesized from the catalytic graphitization of polymeric carbon precursors. These carbon materials possess high surface areas exceeding 300 m^2/g and exhibit good graphitic crystallinity. The synthetic procedure is very simple and can be readily applied to the large-scale and economic production of the carbon nanostructured materials. These carbon nanostructured materials were successfully applied as electrode materials for direct methanol fuel cells. The electrochemical properties of the carbon nanocoils were compared with those of Vulcan XC-72 carbon and commercial catalysts. The carbon nanostructured materials outperform all the carbon materials tested. For example, the specific oxidation currents of the carbon nanocoils and Vulcan-XC72 at 0.4 V are 80 and 21 A/g, respectively (Fig. 3). The synthesis, characterization, and fuel cell performances of these new nanostructured carbon materials will be discussed in the presentation

Reference

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2. Sangjin Han, Youngkwang Yun, Kyung-Won Park, Yung-Eun Sung, and Taeghwan Hyeon*, *Adv. Mater.*, **2003**, 15, 1922.

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Figure 1. The TEM image of hollow graphitic nanoparticles

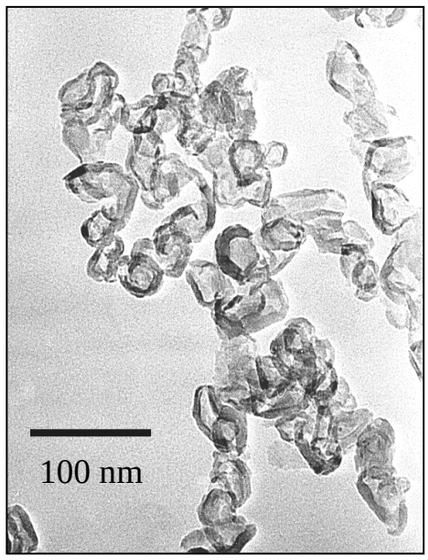

Figure 2. HR-TEM image of Carbon Nanocoils (CNC)

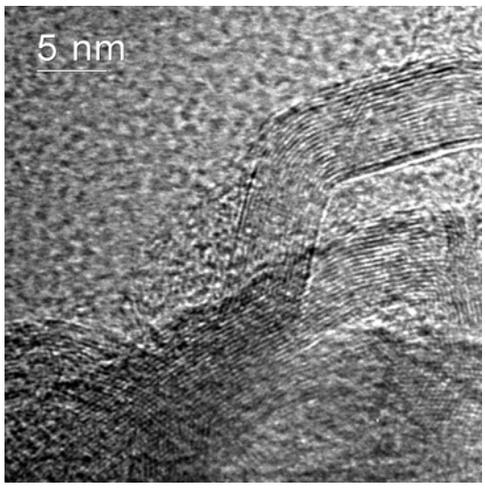

Figure 3. Specific methanol electrooxidation current with respect to applied potentials at 25 °C.