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# Ordered Uniform Bimodal Porous Carbon with Mesopores and Macropores as an Efficient Catalyst Support in Direct Methanol Fuel Cell

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Porous materials with three-dimensionally (3D) interconnected ordered structures are technologically important for a variety of applications including the use as catalysts, supports, separation systems, sensors, adsorbents, electronic materials, double-layer capacitors and hydrogen storage materials. Carbon possesses an excellent chemical, mechanical and thermal stability, and is a very interesting material for a variety of applications. High surface area and well-developed fully interconnected ordered porosity are essential for a catalyst support to result in high catalytic activity. Porous carbon is an important material in low-temperature polymer electrolyte membrane fuel cell because of its surface properties, electronic conductivity, corrosion resistance and low cost. However, it is very difficult to synthesis carbon materials having both a high surface area and an interconnected ordered uniform pore structure. Furthermore, the potential of carbon as a catalyst support has not yet been fully studied. Although many different types of carbon materials are currently available, mainly high surface area activated carbon and carbon black have been used to prepare the supported catalysts. In this work, the fabrication of macrostructurally patterned highly ordered three-dimensionally interconnected porous carbons with uniform mesoporous walls has been demonstrated for the first time by template replication of nanocast aggregates of small silica particles as molds, which were also templated by self-assembled ordered lattice of larger monodisperse polystyrene spheres. This periodically ordered bimodal porous carbon was used as a support for a Pt(50)-Ru(50) alloy catalyst to study its supporting effect on the anodic performance of the catalyst in direct methanol fuel cell. Due to the unique structural properties of the porous carbon with high surface area and three dimensionally interconnected well-combined bimodal porosity, the carbon worked as an excellent support, resulting in great improvement in catalytic methanol oxidation in direct methanol fuel cell.