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Nitrogen doped double gyroidal mesoporous carbon material for oxygen reduction reaction synthesized from pyridine containing precursor, hydroxymethyl-3-hydroxylpyridine

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The Oxygen Reduction Reaction (ORR) is a key reaction for fuel cells. Nitrogen-doped carbon materials show high electrocatalytic performance for the ORR. They are thus among the most promising candidates as alternatives to high-cost Pt catalysts for the cathode of fuel cells. One of the active sites of the nitrogen-doped carbon materials for the ORR was was pyridinic nitrogen. Hence, nitrogen-doped carbon materials containing high concentration of pyridinic nitrogen could be a promising cathode for ORR. In our recent efforts, nitrogen-doped double gyroidal mesoporous carbon material (N-DGMC) was synthesized from the structure-directing tri-block terpolymer poly(isoprene)-block-poly(styrene)-block-poly(ethylene oxide) (ISO) with pyridine containing precursor, hydroxymethyl-3-hydroxyl pyridine, as a nitrogen source and phenol-formaldehyde resol as a carbon source. The total nitrogen contents and relative concentration of nitrogen species were obtained from XPS measurements indicating higher concentration of pyridinic nitrogen than other carbon materials in which nitrogen are doped by an ammonia treatment method. Furthermore, N-DGMC has double gyroidal structure; therefore, it has a large surface area as well as lots of pores, which enable N-DGMC to have high catalytic performance.

Biography

Fumiaki Matuoka has completed his MS from Osaka University School of Engineering Science. He is a Visiting Scholar at Cornell University, Department of Material Science Engineering. His research interest includes "Synthesizing double gyroidal mesoporous template for meta-materials".

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