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Nano Catalysts for Proton Exchange Membrane Fuel Cells

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Proton Exchange Membrane Fuel Cells (PEMFCs) have been of great interest particularly in the automobile industries because of their high energy density and low pollutant emission. However, some of the issues such as, the necessarily high contents of Pt catalysts and their slow kinetics of cathode oxygen reduction reaction remain as obstacles in the commercialization of the PEMFC.

In this presentation, after brief explanation on basic principles of PEMFC and its application to FC vehicles, recent researches to improve the activity and durability of Pt-based nano catalysts toward oxygen reduction will be introduced. It covers size and shape control of Pt nano particle, binary and ternary Pt-M alloys, novel core-shell nano structures of Pt, and a little bit about non-Pt catalysts. Strategies and methodologies for design and synthesis of novel catalysts will also be included.

Keywords: PEMFC, ORR, Nano Catalyst

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Nanostructured Polymer Electrolytes for Li-Batteries and Fuel Cells

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There are rising demands for developing more efficient energy materials to stem the depletion of fossil fuels, which have prompted significant research efforts on proton exchange fuel cells (PEFCs) and lithium ion batteries (LIBs). To date, both PEFCs and LIBs are being widely developed to power small electronics, however, their utilization to medium-large sized electric power resources such as vehicle and stationary energy storage systems still appears distant. These technologies increasingly rely upon polymer electrolyte membranes (PEMs) that transport ions from the anode to the cathode to balance the flow of electrons in an external circuit, and therefore play a central role in determining the efficiency of the devices; as ion transport is a kinetic bottleneck compared to electrical conductivity, enormous efforts have been devoted to improving the transport properties of PEMs. In present study, we carried out an in-depth analysis of the morphology effects on transport properties of PEMs. How parameters such as self-assembled nanostructures, domain sizes, and domain orientations affect conductivities of PEMs will be presented.

Keywords: Fuel Cell, Li-Battery, Polymer Electrolytes