MAR09-2008-004985

Abstract for an Invited Paper
for the MAR09 Meeting of
the American Physical Society

Nanostructured Multimetallic Catalysts in Fuel Cells[1]

CHUAN-JIAN ZHONG, Department of Chemistry, State University of New York, Binghamton, NY 13902

There are two major driving forces for the global interests in research and development of fuel cells: the reality that fossil fuels are running out and the increasing environmental concern over pollution from using fossil fuels. Fuel cells utilizing hydrogen as fuels represent an important form of energy because hydrogen is a highly-efficient fuel and it is environmentally clean. Fuel cells such as proton exchange membrane fuel cell and direct methanol fuel cell are attractive because of their high conversion efficiency, low pollution, lightweight, and high power density. However, one of the important challenges for fuel cell commercialization is the preparation of active, robust and low-cost catalyst, which is key component in fuel cells counting for ∼30% of the cost in manufacturing fuel cells. The durability of the catalysts can also be compromised by sintering and dissolution, especially at high electrode potentials or under load-cycling. We have been developing nanotechnological approaches and investigating nanostructured materials to address some of the fundamental issues in terms of catalyst activity, stability and cost. This presentation discusses recent findings of our investigations of the synthesis and processing for nanostructured catalysts with controlled size, composition, and surface properties by highlighting a few examples of bimetallic/trimetallic nanoparticles and supported catalysts. The results from the characterization of the nanoparticles and catalysts using an array of techniques and computational modeling will be discussed. The synergistic properties of the nanostructured materials in fuel cell reactions, including electrocatalytic methanol oxidation reaction and oxygen reduction reaction, will also be discussed, along with current challenges and opportunities.

[1]Acknowledgement: NSF-NIRT