Non-platinum Catalyst Materials for Low-temperature Fuel Cells

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Low temperature fuel cells are attractive technologies for transportation as well as residential applications due to their quick start up and shut down capability. The focus of the presentation is to analyze the current status of the nanocatalysts both for proton exchange membrane fuel cells and alkaline membrane fuel cells. Preparation processes greatly influence the performance of nanocatalysts. Several synthesis methods are covered for non-noble metal catalysts using various catalyst support materials including carbon nanotubes, carbon nanofibers, nanowires, and graphenes. Ex-situ and in-situ characterization methods like scanning electron microscopy, transmission electron microcopy, X-ray photoelectron spectroscopy and fuel cell testing for the nanocatalysts on various supports both for proton exchange and alkaline membrane fuel cells are discussed in detail. Besides that the possibility of using electrochemical impedance spectroscopy, the most powerful method for resolving complex reaction mechanisms in electrochemical systems is viewed briefly. In addition, the accelerated durability estimation of the nanocatalysts are predicted by measuring changes in electrochemically active surface area using a voltage cycling method as it is considered to be one of the most reliable/ valuable method for establishing durability.