Activated Carbon Nanofibers in Fuel Cells

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Abstract

Electrocatalyst supports play a vital role in ascertaining the performance, durability, and cost of DMFC systems. Myriad nanostructured materials, including carbon nanotubes and nanofibers, have been exhaustively researched over the past few decades to improve existing, and also develop novel, PEMFC/DMFC catalyst supports. This article has reviewed the recent developments and investigations reported on various catalyst supports. Many developments and improvements can be seen in the structure, poisoning tolerance, and stability of various nanostructured carbonaceous supports over the recent years.

In conclusion, the uses of nanomaterials in fuel cells may significantly improve the electrocatalytic performance for high energy density and high power density while reducing the manufacturing cost. The prominent electrocatalytic behavior of the nanomaterials is contributed mainly from their unique physical–chemical properties such as sizes, shapes, pore structures/distribution, surface defects, and chemical properties. The great challenges to synthesize and further use various nanostructured catalysts, such as CNT– and CNF–supported catalysts are not only from chemistry but also from nanoengineering approaches. In general, the core-shell nanostructures could provide an economic and effective way to prepare precious metal catalysts for remarkably reducing the usage of the noble metals while the unique nanostructures, such as nanotubes and nanofibers are believed to provide high specific active surface area, superior conductivity, and better mass transport as well as high intrinsic catalytic activity. An amalgamation of these novel electrocatalyst supports and improved catalyst loading techniques could bring about revolutionary changes in the quest for high-performance, long-lasting DMFCs. However, more detailed investigations (MEA studies, continuous cycling, and accelerated degradation tests) are still required to understand the behavior of these materials under “real” fuel cell conditions.

References

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