

Nano-structured Materials for Next Generation Fuel Cells

Harry L. Tuller

Department of Materials Science and Engineering
Massachusetts Institute of Technology

For the past decade, much excitement has been generated within the field of nano-ionics, given the expectation that decreasing dimensions could lead to breakthroughs in energy conversion and storage technologies. While nanostructured electrodes have been implemented with much success in Li-ion battery technologies, the impact of nano-ionic materials on fuel cell technology remains less clear. The fundamentals of nano-ionics are introduced, with a view towards practical implications for the functioning of solid electrolytes and electrodes. Important phenomena such as ionic conduction, device degradation, and surface reactions are discussed with respect to the increasing role of space charge and strain effects in these small scale devices. Implications for future research and development relating to intermediate-temperature and micro Solid Oxide Fuel Cells will be addressed.