Recent Research & Development at American Elements Using Nanotechnology in Fuel Cells

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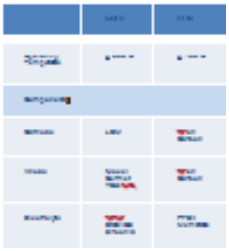
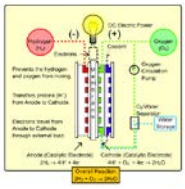
Recent research at American Elements has shown how nanoscale materials can improve the performance of both Solid Oxide (SOFC) Fuel Cells and Proton Exchange Membrane (PEM) Fuel Cells; the two fuel cell technologies with the greatest industrial potential.



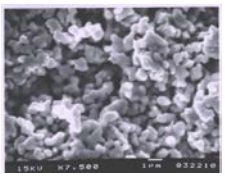
The greatest barrier to the use of solid oxide fuel cells (SOFC) in automotive and aerospace applications is the high temperature at which they operate (800°+ C). Nanoparticle usage is shown to reduce the operating temperatures of SOFCs, facilitating their possible usage in automobiles and other low temperature applications.

The typical electrolyte in SOFCs is yttria stabilized zirconia (YSZ). Research has shown that using nanoscale YSZ increases ionic conductivity at lower temperatures. Additionally, the typical SOFC anode is composed of a nickel cermet (NiO/YSZ). Using nanoscale NiO and YSZ to produce the cermet increases the area of electron conduction without reduction in gas path flow; further reducing operating temperatures.



Carbon nanotubes have the potential to reduce or eliminate the use of platinum in proton exchange membrane (PEM) fuel cells which has made them cost prohibitive for many uses. Research at American Elements has shown that use of multi-walled carbon nanotubes in replacement of carbon graphite dramatically increases the conductivity of the electrolyte. This may make it possible to replace expensive platinum with less expensive alternatives, such as palladium.

Another interesting area of ongoing PEM investigation involves the use of “controlled growth” platinum nanowires grown on carbon nanospheres. Similar research is underway at American Elements coating graphene with platinum nanoparticles and coating “Bucky Balls” (C60 Nanoparticles) with platinum nanoparticles.



Current research showing how nanotechnology may solve the most vexing problems holding back full commercialization of fuel cells is discussed.