Worldwide Nanotechnology Portable Fuel Cell Market Shares Strategies, and Forecasts, 2009-2015

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Abstracts

Portable fuel cells are poised to achieve significant growth as units become smaller and fuels less expensive. According to Susan Eustis, lead author of the study, “Economies of scale do not entirely solve the inherent high costs of high grade metallic catalysts used in micro fuel cells. Nanotechnology is poised to provide new ways to create advanced materials that can be used to implement portable fuel cells. More catalyst price reductions are needed to make portable fuel cells competitive with thin film batteries. Portable fuel cells are useful in cities to power bicycles and for advanced multimedia electronics that draws a lot of power.”

Most of the developing world, where energy and environmental problems abound, still gets around on 2 wheels. 2% of the 1.5 billion population in China owns a car. Cities have started banning the use of 2?stroke engine motorcycles in favor of LPG scooters and electric bicycles.

19 million electric bicycles were purchased in 2008. The trend is expected to continue. As more people need to travel further each year, fuel cells take on a role in short distance travel. As economies evolve, fuel cells provide a role for green energy. Purchasing power constraints and air pollution issues stimulate the need for low cost, zero carbon transportation solutions.

Portable fuel cell vendors are strategically positioned to develop and implement solutions. Technology costs continue to decrease. Practical fuel solutions continue to develop. Experiments with portable fuel cell products are starting to take place in various parts of the world.

Nanotechnology is being used to implement a variety of portable fuel cell solutions.

Many different nanotechnology techniques are being explored. One is of a silicon structure, approximately 400 microns deep, much thicker than the 10?micron depth of a membrane in a traditional PEM?based cell. This design is expected to enable a much larger reaction surface area, enabling high power in a small form?factor.

To compress more power into smaller volumes, researchers have begun to build fuel cells on the fuzzy frontier of nanotechnology. Silicon etching, evaporation, and other processes borrowed from chip manufacturers have been used to create tightly packed channel arrays to guide the flow of fuel through the cell.

The point is to pack a large catalytic surface area into a wafer?thin volume. This approach is evolving, going beyond two?dimensional aspects to gain more surface area. Methods improve the performance of nano?scale fuel cells.

Three?dimensional structures improve current electrocatalysts that have traditionally been expressed on a flat surface. Two dimensional catalysts give hundreds of microamps per square centimeter, while three dimensional catalysts increase the surface area by orders of magnitude.

Fuel channels are evolving in ready?made in a commonly available, porous alumina filters costing only about $1. The filter is riddled with neat, cylindrical holes only 200 nanometers in diameter, and was initially used in labs as a template for the growth of nanowires.

Nanowires can be grown in a platinum?copper alloy, then dissolving the copper by soaking the filter in nitric acid creates electrodes. In place of a solid nanowire, each hole is left with a porous platinum electrode. The partially dissolved wires are structurally complex, as befits their random nature, and have an enormous surface area for their size.

The market size for portable fuel cell power at $80.1 million in 2008 is estimated to reach $4.4 billion dollars by 2015. Existing markets are from mobile homes and PCs used remotely. Strong growth comes as hybrid fuel cell systems evolve to support thin film batteries. The fuel will come from renewable energy sources.

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