



History of Fuel Cells

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In the 1950's and 1960's, one of the most high profile applications for fuel cells arose from the USA National Aeronautics and Space Administrations (NASA) need for electrical energy in extended missions into space. The NASA alkaline fuel cell uses hydrogen and oxygen as fuel, and combines the two chemicals in an electrochemical reaction. Out of this comes three useful by-products in spaceflight - electricity to power the spacecraft, water for drinking and for cooling equipment and heat to keep the astronauts from freezing.

The discovery of fuel cells dates back to the early 1800s. The first positive identification of the fuel cell effect was in 1838 by Christian Friedrich Schoenbein, a Swiss scientist. His friend Sir William Robert Grove, a Welsh judge, invented and refined the first fuel cell device from 1839 to 1845. Grove's apparatus took in hydrogen and oxygen and produced small amounts of electricity as well as water. It had a platinum electrode immersed in nitric acid and a zinc electrode immersed in zinc sulphate and generated a current of about 12 amperes at about 1.8 volts. Others who worked on fuel cells include William Jacques, Walther Nernst and Emil Baur.

Date	Milestone
1838	Christian Friedrich Schoenbein carries out first systematic scientific investigation on the fuel cell effect
1845	Sir William Grove invents first fuel cell (H ₂ SO ₄ + platinum electrodes, H ₂ and O ₂)
1896	William Jacques develops first fuel cell for household use
1900	Walther Nernst first uses zirconia as a solid electrolyte
1921	Emil Baur constructs the first molten carbonate fuel cell
1930s	Francis Bacon researches alkaline electrolyte fuel cells; Emil Baur and H. Preis experiment with solid oxide electrolytes
1962	Research into solid oxide technology begins to accelerate in the US and Netherlands. Allis-Chalmers Manufacturing Company demonstrates a 20-horsepower fuel-cell-powered tractor

Source: *The Birth of the Fuel Cell 1835 – 1845*, Ulf Bossell, Switzerland, 2000 and *Fuel Cells; Power for the 21st Century*, US Dept of Energy, 2004, p7.

In the late 1930s Francis Thomas Bacon began work on alkaline electrolyte fuel cells, and by 1939 he built a cell using nickel gauze electrodes operating under high pressure (3,000 psi). During World War II, Bacon worked on fuel cells for British Royal Navy submarines and in 1958 demonstrated an alkaline cell using a stack of 10 inch diameter electrodes.

Interest in fuel cells increased in the 1950s – 1960s and also the 1980s when the industrialised world experienced major oil shortages. Around this time, countries were also becoming concerned about air pollution and looking for clean electricity generation options. Today, governments, institutions and commercial organisations are developing a range of fuel cells for a number of different industrial and domestic applications.

Ceramic Fuel Cells Limited founded in 1992, is continuing to develop Solid Oxide Fuel Cells (SOFC) into the 21st century with a number of significant patents and innovative technology covering the materials, processes and production of SOFC systems.