



China's Business Newspaper

Pointing the way with fuel-cell drive

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Tuesday, January 14, 2014

A Hong Kong University of Science and Technology scientist claims his team has made fuel cells four to six times more efficient than current devices.

Zhao Tian-shou, chair professor in the Department of Mechanical and Aerospace Engineering, said the research results could be applied to some industries in seven to eight years.

"It paves the way to further develop fuel cells as a clean, efficient and sustainable energy production technology, which can be widely used in mobile phones, computers, automobiles, buildings, submarines, power plants and the military," he said.

Using direct methanol and ethanol fuel cells to power a car or a phone under the framework would be faster, cheaper, cleaner and more efficient.

He and his team improved the efficiency of fuel cells during experiments because they found a way to achieve synergy of the physical and chemical reaction. "We found the underlying mechanism of coupled multiphase heat and mass transfer and electrochemical reactions in fuel cells," he said.

If the cellphones use methanol and ethanol fuel cells, the electricity can be used for twice the time of a normal cellphone battery.

Unlike a battery, a fuel cell is a device that converts chemical energy from fuel into electricity.

Hydrogen is the most common fuel while hydrocarbons such as natural gas and alcohols like methanol are used in some industries.

Ethanol is an alternative to methanol, which is less toxic and can be obtained in large amounts through fermentation from wheat, corn, sugar cane or straw.

Batteries need to be charged when the electricity runs out and it usually takes hours to charge an electric vehicle's battery.

Although a constant source of fuel is required to sustain the chemical reaction, fuel cells can produce electricity continually as long as the fuel is filled up.

However, Zhao said the fuel cells are not as efficient as expected because voltage is lost during the electricity production process.

NASA space programs used fuel cells to generate power for probes, satellites and space capsules.

Zhao's team received second-class State Natural Science Awards last year at the National Office for Science and Technology Awards in Beijing.