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Ethanol fuel as portable power source in alkaline fuel cells

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Ethanol is an environmentally friendly fuel and possesses higher energy density than methanol (8.00 vs. 6.09 kWh kg⁻¹). It can be easily produced in large quantities from biological processing of agriculture products and is considered a renewable energy source. This hydrogen-rich alcohol fuel is easier to transport, store, and handle than conventional hydrogen fuel, and has become an attractive alternative to hydrogen for direct oxidation fuel cells. Direct ethanol fuel cells (DEFCs) have become promising power generation technology because of the simple systems, especially for portable, mobile, and transportation applications. In this presentation, an overview of research progresses on DEFCs will be briefly summarized, with an emphasis on electrolyte membrane development. The pros and cons of DEFCs operated in acidic and alkaline modes will be discussed. Efforts on advancing ADEFCs include the development of catalysts, membrane electrolytes, single cell design, and improvements in operating conditions. Several membrane electrolytes based on nano-composites have been studied by the author's group and the material design guideline will be proposed. DEFC performance using non-platinum based catalysts will be reported. The attempts to improve alkaline DEFC performance through several routes are reported in this work, including development of electrolytes, catalysts, and catalyst porous substrate. The results obtained by the author's group are compared with literature data. The outlook and future work toward commercialization of the DEFCs will be discussed.

Biography

Shingjiang Jessie Lue obtained a BS and MS degrees from National Taiwan University, and a PhD degree of Biotechnology Engineering from University of Missouri-Columbia, USA, in 1990. She joined Chang Gung University in 1996 and is now the Department Chair of the Department of Chemical and Materials Engineering at CGU. Her research interest focuses on the development of high-performance materials for separation, energy, and biotechnology applications. She has published more than SCI papers and 2 book chapters, given 140 conference presentations, and applied 2 patents.

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