THE JPL DIRECT OXIDATION, LIQUID-FEED METHANOL FUEL CELL

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Fuel cells that can operate directly on fuels such as methanol are attractive for several defense and transportation applications in view of their lower weight and volume. The weight and volume advantages of direct oxidation fuel cells are due to the fact that t-hey do not require any major auxiliary equipment for its operation. Elimination of the auxiliary equipment items results in simpler design, operation, higher reliability, less maintenance, and lower capital and operating costs. JPL and other several organizations have been working together under a DARPA sponsored program since 1990, to develop this technology, for future defense appl ications. JPL has identified a unique liquid feed design for direct oxidation methanol fuel cells. This cell employs a solid polymer membrane as electrolyte, Pt alloy catalysts for the fuel electrode and Pt catalyst for the oxygen electrode. The liquid feed design has numerous advantages over the prior art gas feed design for direct oxidation methanol cells including: a) elimination of fuel vaporizer and its associated heat source and controls, b) elimination of complex water and thermal management systems, c) significantly lower overall system size and weight. The presence of water in the methanol liquid feed maintains the humidity of the polymer electrolyte membrane. Laboratory versions were developed in association with Giner and USC. The cells fabricated so far been were shown to deliver an output of 0.50 V at 300 mA/cm2. This cell was also shown to operate on many other liquid fuels. The output level of this cell is quite high relative to that of prior art direct oxidation methanol fuel cells and is already in the range of interest for practical applications. This paper describes JPL task and progress made to datevfar.

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