Effects of Temperature on the Performance and Efficiency of Proton Exchange Membrane Hydrogen Fuel Cells (PEMFC)

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My research problem deals with the recent advancements in hydrogen fuel cell technology. The research of hydrogen fuel cells is important due to its modern use in automobiles, as well as its capability to be a reliable and efficient form of green energy. The purpose of my research is to determine the optimal temperature for maximum efficiency. This temperature can be found through measuring multiple different variables, all of which affect the power output and overall efficiency of the hydrogen fuel cell. A hydrogen fuel cell's primary function is to use hydrogen and oxygen gas to produce heat and electricity. To perform this reaction, water must first be converted into hydrogen and oxygen gas through a process called electrolysis. This process was performed in this experiment by supplying the PEMFC with 12mL of distilled water to the two compartments. The cell was then provided with 5V of electricity with a 144W power supply until the water had fully reacted. The PEMFC was then connected to a motor. The motor was resisted fully and voltage was measured with a multimeter. The voltage and battery life was recorded across three separate trials, and the process was repeated for temperatures ranging from 50°F to 75°F. The data collected concluded that the colder temperatures reflected a longer battery life and slightly higher voltage. The trial at 50°F had an average output of .5V and total battery life of 460s, while the trial at 75°F showed a .4V average and 300s total battery life.

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