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Performance assessment of hybrid PEMFC-solar energy integrated hybrid multi-generation system for energy production sport buildings

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Polymer membrane electrolyzers are a useful tool for producing hydrogen, which is a renewable energy source. Unmanned aerial vehicle (UAV) fuel cells can be powered by the hydrogen and oxygen produced by the electrolyzer. The primary losses of polymer membrane electrolyzers must therefore be identified in order to maximize their performance. A renewable-based multi-energy system considers power, cooling, heating, and hydrogen energy as utility systems for integrated sport buildings. In this study, we investigate the effect of radiation intensity, current density, and other performance factors on the rate of hydrogen production in water electrolysis using a polymer membrane electrolyzer in combination with a solar concentrator. The findings showed that a rise in hydrogen generation led to an increase in current density, which increased the electrolyzer's voltage and decreased its energy and exergy efficiencies. The voltage was also increased, and the electrolyzer's efficiency was enhanced by a rise in temperature, a decrease in pressure, and a reduction in the thickness of the nafion membrane. Additionally, with a 145% increase in radiation intensity, hydrogen production increased by 110% while the electrolyzer's energy and exergy efficiencies decreased by 13.8% as a result of the electrolyzer's high input electric current to hydrogen output ratio.

Topics

Energy efficiency, **Hydrogen energy**, **Renewable energy**, **Solar energy**, **Fuel cells**, **Electrolyzers**

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