

ABSTRACT

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Title: Electrochemical Characterization of Energy Storage Devices with Associated Lesson Plans for Secondary Education Implementation

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The desire for technology advancements of energy storage devices and the increased usage of renewable energy sources requires in depth research and analysis about the performances of these devices. Fuel cells, and the reverse counterpart, electrolyzers, are up and coming, dynamic devices which can consistently produce energy when supplied with a fuel source and connected to a power source. Through electrochemical characterization, scientist and engineers can gain valuable information about the efficiency of various operating parameters of the cells. This study focuses specifically on the efficiency of a single cell PEM electrolyzer when operating under different water temperatures. Electrochemical characterization techniques such as, linear sweep voltammetry, cyclic voltammetry, and measuring output gas volumes were used to provide an analysis and characterization of the cell. Based on theory, it is expected that as the electrolyzer temperature increases, the cell efficiency will also increase due to the increased reaction rates and ionic conductivity. Teaching the next generation about the science theory and research behind a multitude of devices and parameters is vital to continue the use and advancement of these devices. In addition to conducting electrochemical testing on an electrolyzer cell, high school level lesson plans, related to electrolysis and energy storage, were created for implementation in secondary schools.