

Design and Analysis of Solid Oxide Fuel Cell System Powered by Seaweed-Derived Biogas

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Over the last three decades, fuel cell technology has progressively advanced into one of reliable power sources. Solid Oxide Fuel Cell (SOFC) is the most promising fuel cell technology for stationary power generation. Renewable energy sources, such as biogas, are being intensively investigated as replacements for traditional fossil fuels used in SOFC (e.g. natural gas). In this work, prospective replacement considered is biogas derived from seaweed, i.e., brown algae (*Laminaria japonica*). In order to assess alternative fuel for conventional technology, process simulation and optimization is required. For that purpose, process simulation software, Aspen Plus, was used. The SOFC stack model was based on the tubular SOFC developed by Siemens Power Generation, Inc (SPGI) with a desired output of 120 kW. The mass and energy balances, voltage, and the efficiency of biogas-fueled SOFC were computed. Techno-economic assessment was performed to determine the economic feasibility of the fuel source considered in this work. Future works include integration of this technology to macroalgae biofuel platform.