Synthesis and Application of Emerging Anode Material in Solid Oxide Fuel Cells

Popescu, Alexia (School: Niles Township West High School)

When over 850,000 people lost access to electricity in Puerto Rico April 12, 2018, the global instability of the power grid was exposed. More than an inconvenience, buildings vital for society's functionality (e.g. hospitals, power plants, government) cannot afford to lost power in such scenarios. To address the issue, this project focused on improving the performance of the alternative energy solution, solid oxide fuel cells (SOFCs), which are an increasingly reliable source for backup generators. This was done by optimizing synthesis methods of the anode material, strontium vanadomolybdate (SVM), and applying it to a symmetric cell system to explore impedance mechanisms. In this study, various conditions (temperature, hold time, atmosphere) were used in different synthesis methods. Once the best combination of synthesis conditions resulted in the desired material structure, the synthesized powder was made into an ink and applied in a symmetric SOFC. The desired phase best resulted from the powder synthesized by citrate technique with a furnace temperature of 600 C held for 12 hours in air followed by a multi-step sequence of 600 C in 5% H2, 750 C in 5% H2, and 2 steps at 1200 C in 1% H2. The success of the designed synthesis process was supported by x-ray diffraction results. This synthesis process can be applied to industry in order to improve SOFCs. The next step is to run electrochemical impedance spectroscopy and deconvolute present mechanisms. Future research includes experimenting with various electrolytes, computational calculations, and compiling a full SOFC to test.

Awards Won:
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