A Novel Single Compartment Concentration Cell Powered by Natural Evaporation for Green Energy Harvesting and Storage, Year Two

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The first year's study involved the invention of a novel concentration cell with a single-liquid compartment for green energy harvesting. This year's goal was to improve the performance of the cell and investigate rechargibility of the cell. The hypothesis was that the performance of the cell would be improved by modifying the cell design (e.g. by increasing the electrode surface area). A paste with Nafion and silver nanoparticles was used to coat the silver wire electrode and increase the electrode surface area. Another fabric layer was used to cover the coated electrode on the outside porous cup to maintain a constant concentration difference. As a result, the power density of the single-compartment cell was improved by a factor of 92, making it more suitable for powering low-power devices. More importantly, the cell was quickly rechargeable using a solar charger, making integration of the cell as storage device with existing solar energy grids more feasible. Unlike most batteries on the market, the single-compartment cell did not consume any metals and did not involve any toxic or harmful chemicals. It did not require sunlight to operate, making it a good energy storage device. The cell could be used as an environmentally friendly and renewable battery for powering sensors and wireless communication devices, especially in remote areas where power is unavailable. In conclusion, the cell performance was significantly improved by increasing the electrode surface area and adding a layer of fabric to the cell. Solar energy was successfully used to regenerate the electrodes.

Awards Won:
Fourth Award of $500