Testing the Effectiveness of a Polyvinyl Alcohol Polymer Layer Bonded to Lead-Chelating Agents versus a Phosphate Salt Layer on the Minimization of Lead Iodide Leaching in Perovskite Solar Cells

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Due to the inefficiencies of silicon solar cells, scientists developed perovskite solar cells that are 50% more effective. However, they are environmentally harmful, containing lead iodide that can leach into soil if the cell is damaged. Since the current solution of phosphate salt is ineffective, the project aims to solve the issue novelly by testing the effect of a polyvinyl alcohol layer bonded to lead chelating agents such as disodium EDTA, tetrasodium EDTA, and chlorella and cilantro natural agents against phosphate salt on a damaged perovskite solar cell's production of lead iodide. The perovskite cell was built from scratch and the efficacies of the layers were determined by utilizing a voltmeter to see if they affected the cell's electrical output and a TDS meter to measure the quantity of lead trapped. Tetrasodium performed the best averaging 0.1 millivolts change in electrical output and reducing lead production by 73.89%. Next most efficient was the natural agent with 0.27 mV and 67.78%, disodium with 0.1 mV and 66.67%, and phosphate salt with 0.37 mV and 62%. Overall, this project discovered materials more effective than the current solution and created an inexpensive method that traps lead better through the agents' ligands that possess stronger bond polarities. Additionally, chelating agents have medicinal purposes and are safe to ingest unlike phosphate. The layer's potential can be improved with more molar and various chelating agents as limited laboratory access restricted purchased concentrations and types of agents tested.

Awards Won:
Third Award of $1,000