Testing the Effectiveness of a Bioplastic Layer Bonded to Natural Chelating Agents on the Minimization of Lead Iodide Leaching in Perovskite Solar Cells and a Novel Antireflective Coating Derived From Corn and Lotus Leaf Imprints on the Cell

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Due to the inefficiencies of silicon solar cells, scientists developed perovskite solar cells that are 20% more effective. Unfortunately, they are environmentally harmful and contain lead iodide that can leach into soil if the cell is damaged. Since the current solution of a phosphate salt layer only minimizes 62% of lead leached and a chemical chelating layer I designed last year was deemed expensive, the project aims to solve the issue novelly by testing the effect of a bioplastic layer bonded to cheaper natural chelators derived from kelp, cilantro, chlorella, and spirulina against the chemical chelator, tetrasodium EDTA, on a damaged perovskite solar cell's production of lead iodide. The perovskite cells, bioplastic, and chelating agents were all constructed from scratch, and the protective layer was prototyped 50 times to ensure that it only dissolves in a lead iodide solution and does not affect electrical output. The spirulina chelator performed the best, reducing averaged lead production by 95.31%. Next most efficient was the cilantro by 90.64%, tetrasodium by 84.38%, kelp by 74.6%, and lastly the chlorella by 64%. Furthermore, the project incorporated new research on biological antireflective coatings which previously have increased panels' efficiency by 12% through imprinting the surface structures of flower petals on an exterior polymer layer. However, the project tested original biological antireflective coatings of corn and lotus leaf surface structures imprinted on the bioplastic layer and resulted in a 16.22% efficiency amelioration by the corn and 23.9% by the lotus leaf.

Awards Won:

Second Award of $2,000

Missouri University of Science and Technology: Summer Camp scholarships (camp tuition and travel expenses, valued at up to $1,500)