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Harvesting Solar Energy using Perovskite Photovoltaic Cells for Improved Applications in Portable Devices

Portable solar charging cells offer a convenient source of renewable power when outlets are not available, but the average charge time for an 18 W battery takes about 6- 8 hours with full sun. The purpose of this project is to research, design, and test a portable solar charger that can harvest energy at a faster rate using perovskite. Before any testing could be done, extensive research was conducted on the perovskite and the make-up and function of a solar cell. A solar cell, or photovoltaic cell, is a nonmechanical device that converts sunlight directly into electricity. Solar cells are becoming an increasingly vital source of renewable energy, but their overall efficiency is not sufficient for high power applications. Perovskite is a calcium titanium oxide mineral that offers excellent light absorption, charge-carrier mobilities, and lifetimes, resulting in high device efficiencies with opportunities to create a low-cost, industry-scalable technology. Studies have shown that perovskite can increase the overall efficiency of a solar cell. To validate whether perovskite is more efficient, a comparative analysis study will be done on both a regular silicon and a perovskite infused DIY solar cell. Once results are validated, the perovskite cell will be incorporated into two portable battery pre-designs developed using 3-D printing. The design's intended purpose will be to harvest, store, and power small applications such as a phone or fan motor. Lastly, once both pre-designs are tested for maximum efficiency a final design will be decided upon for refinement.