



Perovskite Solar Cells to Extend Drone Battery Life

TECHNOLOGY NUMBER: 2024-360

Accelerate Blue Foundry - 2025 (Physical Sciences)

OVERVIEW

Stable, lightweight, flexible perovskite solar cell that extends the operating time and flight range of battery powered drones.

DESCRIPTION

This device is a perovskite solar cell (PSC) that offers a power-to-weight ratio 4X-10X that of other solar cell chemistries. The remarkable power-to-weight ratio of PSCs is due to their thin film configuration (which allows for integration with flexible substrates), in combination with their exceptional energy conversion efficiency that they offer (35% or even higher). However, PSCs have historically suffered from rapid degradation in performance.

This technology utilizes multiple new passivation strategies that prolong photovoltaic performance with practically no extra weight. They can be applied to both rigid and flexible PSCs. One is an encapsulation chemistry that is implemented prior to device sealing. Another is a passivation technique to maintain the integrity of the interface between the absorber and hole transport layers. A third utilizes an additive to further stabilize the perovskite absorber layer. The encapsulation technique alone has been demonstrated to increase device stability by almost 10X.

The envisioned product is a consumable, soft PSC patch that can be applied as a retrofit to battery powered devices such as quadrotor drones, where a high power to weight ratio is critically needed. These flexible, lightweight solar cell patches will be conformably applied to the drone in order to extend battery life up to 140% of battery-only systems. The consumable solar cell patches, integrated in a modular fashion on the drone, can be replaced as needed.

Technology ID

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Category

Engineering & Physical Sciences
Accelerate Blue Foundry -
2025/Physical Sciences

Inventor

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Further information

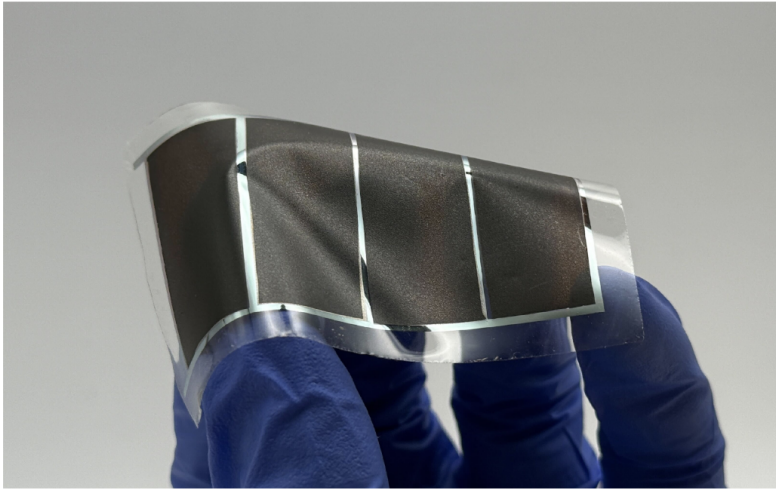
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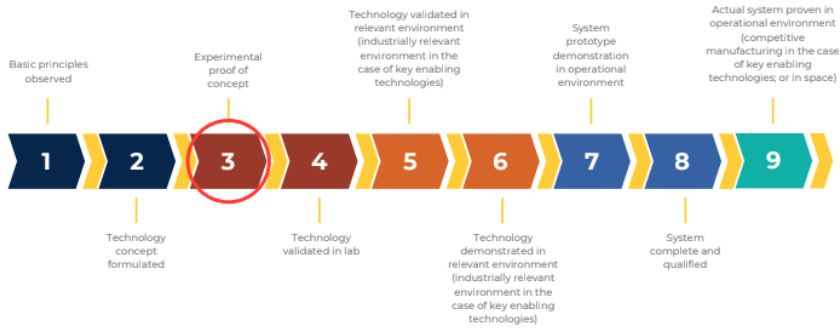


VALUE PROPOSITION

- **Stable, lightweight solar cells:** 4X-10X the power-to-weight ratio of other solar cell technologies, increased stability and extended performance over traditional PSCs
- **Extended battery life / range of operation:** extend battery life to 140% or even higher, enabling longer operational times, greater flight ranges, more productive flights, less time on the ground recharging
- **Consumable, soft PSC patch:** flexible patches conform to the surface of the drone, enabling aftermarket applications and easy replacement when needed

TECHNOLOGY READINESS LEVEL

Technology Readiness Levels



INTELLECTUAL PROPERTY STATUS

Patent applications in process.

MARKET OPPORTUNITY

This technology enables an ideal product to extend the operational time and flight range of drones. This is a particular challenge with quadrotor drones where the extra weight quickly negates the extra power capacity offered by additional batteries, not to mention the increased cost and decreased safety associated with today's battery technology. Solar cells offer numerous advantages over batteries, and the dramatically higher power-to-weight ratio of PSCs makes them superior to other solar cell chemistries for this application.

Over all segments (consumer, commercial, and defense), the total drone market is estimated to be approximately \$75B today, with \$11.25B of that attributed to batteries. Both figures are expected to more than double by 2035. Extensive customer discovery activities have identified a critical need to extend flight time among drone users among multiple government entities, including defense agencies and the national park system. Multiple interviewees at these entities have expressed that the current flight times of 20-40 minutes are woefully inadequate. National parks in particular, with an estimated market size of \$6.7 million, represent an excellent beachhead market for this versatile technology. The commercial drone battery market, sized at \$2.1B, provides ample additional opportunity for this technology.

