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Anthro Energy Capabilities Statement

Smart Electrically Powered And Networked Textile Systems (SMART ePANTS) Research Program

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Company Overview

Anthro Energy, Inc. is a San Jose, CA based producer of conformal and flexible batteries. Leveraging advanced materials developed at Stanford University, Anthro Energy's batteries are safe, flexible, and high performance. Anthro's batteries are the perfect solution for developing next-generation wearable and medical devices. The flexible nature of the cells allows them to be integrated into 'dead-space' of devices such as straps, bands, and substrates. Utilizing this dead space can provide multi-fold improvements in capacity as well as significant enhancements to user comfort. Our cells can be fabricated in a variety of shapes and sizes to fit the needs of a specific wearable product. Anthro's cells are non-flammable and impact resistant, greatly enhancing product safety. We utilize modern manufacturing techniques to ensure high reliability and safety. Our products are being tested across the country for integration into a wide range of cutting-edge technologies.

Anthro Energy's batteries are the perfect solution to power the garment-integrated sensor system envisioned for the SMART ePANTS program. This document outlines two relevant capabilities that Anthro Energy will provide for the program. We discuss our cell power and performance capabilities along with our product integration capabilities.

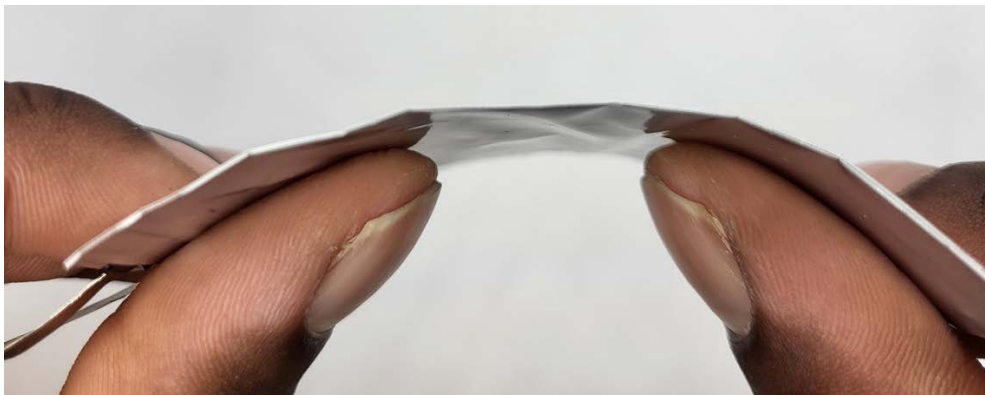


Figure 1. Anthro Energy Flexible Battery Cell



Battery Cell Capabilities

Anthro Energy's flexible battery cells can be customized to meet the needs of the final device in a SMART ePANTS solution. Here we list a range of specifications for expected performance of the cells.

Metric	Capability
Capacity	50 mAh – 500+ mAh, depending on size
Voltage	3.7 V, can be increased with multiple cells
Charge/Discharge Rate	1C (1 hour charge/discharge)
Thickness	0.5 mm – 2 mm
Dimensions	1.5 cm to 15 cm in each direction
Cycle Life	800+ cycles
Bending Radius	2mm-20mm, depending on thickness
Bending Cycles	10,000+
Bending Modes	Multi-axial folding, torsion
Temperature Range	-20C to 60C
Flammable	No
Washable	Yes, with proper encapsulation
Shelf-Life	>1 year

Anthro Energy has the ability to rapidly iterate the cell design to meet product needs. Our achieved energy density is similar to conventional Li-Poly cells both gravimetrically and volumetrically. Compared to a conventional rigid battery, a solution designed with Anthro Energy cell technology will be more comfortable, thinner, have more area to integrate batteries, and safer. Within the parameters described above, Anthro will create a suitable solution to power any wearable device.

Device Integration Capabilities

In addition to producing conformal batter cells, Anthro Energy works to create suitable product integrations across a variety of applications. We specialize in developing tailor-made encapsulants, connectors, and sealants to successfully integrate conformal batteries into wearable and medical devices. In Figure 2 below, we integrated a 250 mAh 'watch band' battery to power a smartwatch. The results is a flexible battery band that looks and feels like a normal watch wristband, but the device has 2x battery capacity.



Figure 2. Battery embedded into smartwatch wristband

Anthro Energy has also worked to incorporate our flexible battery cells into textile chassis. This will be highly relevant for the SMART ePANTS program. Integrating the battery into a textile chassis makes them effectively ‘invisible’ within the clothing. Figure 3 shows a demonstration of a textile-embedded battery cell. Batteries may be designed for either removing for washing or designed to wash with the garment.

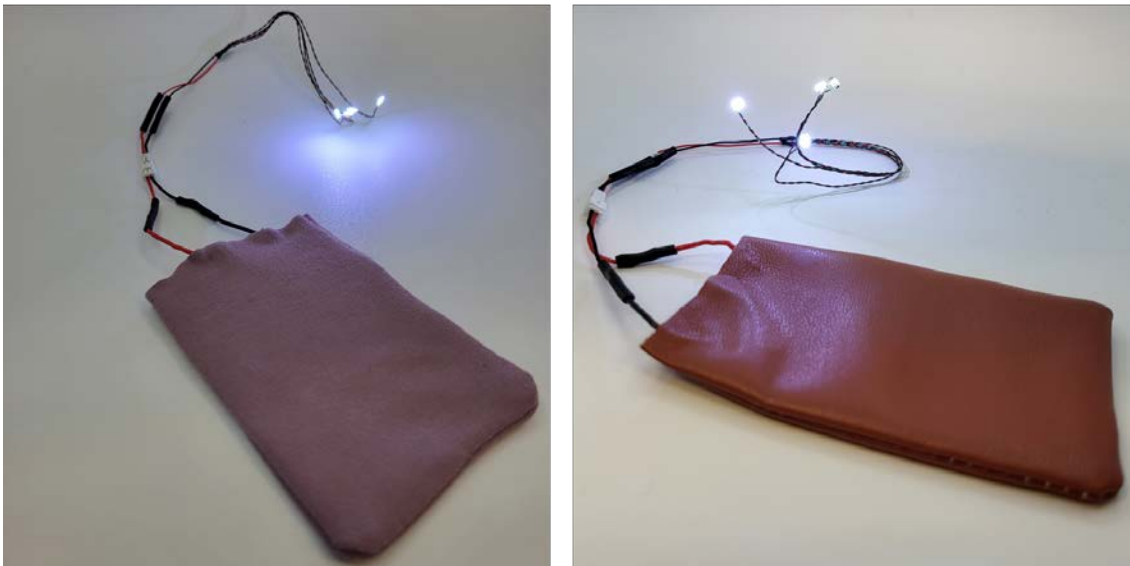


Figure 3. Various encapsulations. Textile encapsulation (left) and faux leather encapsulation (right)

Finally, Anthro Energy can integrate a variety of connectors. This includes wires, magnetic connectors, JST connectors, solder pads, and welds. Our cells are compatible with the needs of the final device to provide robust, stable, and reliable power to a flexible powered garment.

We are looking forward to teaming with partners to power the SMART ePANTS program and create ‘tactilely invisible’ wearable electronics.