Perth, Australia
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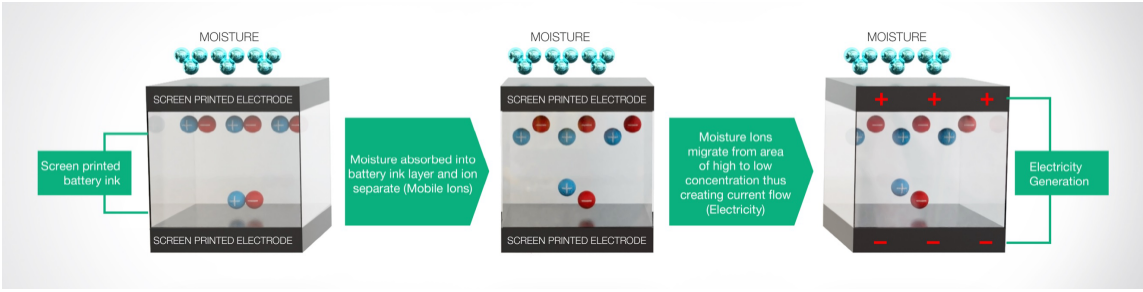
SOR Achieves Ultra-Stable Voltage From Moisture

Strategic Elements Ltd (ASX: SOR) is pleased to announce multiple Energy Ink™ battery breakthroughs in materials engineering and power management targeted towards the rapidly growing USD 10 billion Electronic Skin Patch market[1]. Testing has shown a further **225% increase in power output,** and importantly, for the first time, an **ultra-stable output voltage** was demonstrated from moisture.

Stable output voltages are critical to power the sensitive electronic circuits contained in many electronic devices, enabling them to perform more reliably and without error. It is unusual to demonstrate such a stable output voltage this early in the development of a new battery technology. Given the revolutionary manner in which the Energy Ink generates energy from moisture, it is a highly important early achievement.

Generating Energy From Moisture

The Energy Ink operates like no other form of energy generation available today through water molecules in the air being absorbed into a layer of nano-engineered ink. Ions separate and migrate from high to low concentration, creating an electrical current flow. Unlike traditional batteries, the Energy Ink uses materials that are flexible, safe and non-flammable, ultra-thin and generate energy from moisture, a green, readily available source.



Key Achievements

- Innovative work at UNSW laboratories in printed electrode design, nanoengineering and integration of various functional materials significantly upgraded the ability of the Energy Ink to produce a highly stable output voltage from moisture.
- The Perth Engineering Lab utilised a new power management module to further modulate and control the output voltage whilst emulating the load of a leading Continuous Glucose Monitoring (CGM) skin patch. An ultra-stable, highly controlled output voltage demonstrated the stability to power sensitive digital electronics such as CPUs, memory and wireless communications.
- The output voltage was extremely stable, being maintained at 1.8V with a maximum variation during the test of +/-10mV or within a tolerance of +/-0.5%. This is considered a very tight operating range under full load for power supply to digital electronic circuits. For comparison, the input voltage tolerance range for the circuitry used in a leading skin patch is 150mV, and the stated tolerance requirement for computer motherboard power supplies is between +/-5% and +/-10%.
- In addition, a 225% increase in power output was achieved, as compared with the simple power management reported in December 2022. This demonstrated that Energy Ink cells can supply energy at twice the rate consumed by a leading CGM skin patch over 7 days.
- Despite the revolutionary method of generating energy, successful engineering enabled a basic power management circuit using off-the-shelf integrated circuits to be used.

Testing - Electronic Skin Patch

Testing was conducted by simulating the load of a leading Continuous Glucose Monitoring (CGM) skin patch. With the use of these devices expected to surge globally, the clear goal for manufacturers is to make devices as inconspicuous as possible, provide more advanced sensing, keep costs low, and be friendlier to the environment. The advantages of the Energy Ink technology align with these goals.

CGM patches (and their batteries) are replaced by the user every 10-14 days. Worldwide there are over 7 million users (equating to over 150M patches), with the segment undergoing rapid growth. For example, the leading CGM Company posted sales of $1.1 billion in the fourth quarter of 2022 alone, a year-over-year jump of more than 40%. The second-ranked Company reported $815 million, up 17% year-over-year[3,4].

CGM patches are just one segment of the overall Electronic Skin Patch market that provide sports, health and other information from devices attached to the human body. The overall market is forecast to grow to USD 30 billion by 2031[1].

Testing Details

To test the upgraded Energy Ink and new power management module, two Energy Ink cells of 4x4 cm size were used under the same conditions as the rudimentary power management circuits in December 2022.

The power management circuit is positioned between the Energy Ink™ cells and the load being powered and acts in a capacity as both a regulator and buffer. Over time the instantaneous power requirements for loads fluctuate, which can cause variations in the output voltage of the Energy Ink™ cells. As a regulator, the power management circuit keeps the output voltage across the load constant, enabling it to function correctly. In addition, there may be periods where the load causes spikes in energy demand, and as a buffer the power management circuit can store up additional charge to be released into the load to help meet this requirement whilst still regulating the voltage. In testing, a capacitor was used by the power management circuit to store the energy used to buffer the power consumed by the simulated skin-patch load.

In order to maximise control over the output voltage, during the low power phase, additional power is generated from the Energy Ink™ cells and stored in a capacitor to increase the power available during the high power phase. Additional experiments monitoring the capacitor during the high and low power phases confirmed that the capacitor discharges and charges during these respective phases.

Ongoing Work

The Energy Ink™ is still in early development, and the fundamental upper limit of aspects such as maximum power output, duration and energy density remains unknown. The team has successfully progressed the Energy Ink™ from the initial concept to successful breakthroughs, increasing the electrical charge capacity from microamps to milliamp-hours (mAh) and, in recent work, to ampere-hours (Ah).

Traditional batteries are constrained into set shapes and form factors, whereas the Energy Ink provides new creative freedom in design. The next phase of work in the Electronic Skin Patch segment is to optimise the ink and printing capability of the cell structure and successfully print batteries into alternative shapes and patterns. The team will also fabricate smaller cell sizes and integrate them with a more customised power management module to test the lower limit in cell size for Electronic Skin Patches. **Results are expected in Q2,2023.**

As previously announced[2] ongoing development success has opened potential R&D pathways for larger-scale Energy Ink systems. The Company has been actively investigating the potential to conduct larger-scale systems through Energy Ink packs with multiple cells or significantly larger cell sizes. **Further information will be released in Q1, 2023.**

Strategic Elements – Pooled Development Fund

The Australian Federal Government has registered Strategic Elements as a Pooled Development Fund with a mandate to back Australian innovation. The Company supports leading Australian scientists and innovators in high-risk-high reward ventures. SOR majority funds initial development whilst seeking a major strategic investor/partner to assist commercialisation. Investors in SOR have potential tax benefits as the Company operates under the Pooled Development Program. More information should be read on the Company's website.

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This announcement was authorised for release by the Strategic Elements' Board of Directors.

1. https://www.idtechex.com/en/research-report/electronic-skin-patches-2021-2031/821
2. ASX Announcement February 20,2023
3. https://www.nasdaq.com/articles/heres-why-you-should-retain-abbott-abt-stock-for-now-3
4. https://www.investors.com/news/technology/dexcom-stock-dexcom-earnings-q4-2022/