Australian Stock Exchange
Regulatory Release
March 30th 2021
CODE : SOR

SOR Self-charging Battery Cells Bent 2000 Times

Western Australia – March 30th 2021 - Strategic Elements Ltd (ASX:SOR) has achieved another milestone with its self-charging battery technology fabricated onto a flexible textile cloth and mechanically bent over 2000 times. Current battery technologies (alkaline, coin, lithium) are rigid and bulky and are not suitable for flexible electronics or in very small and thin devices. In early stage work the battery ink technology has shown strong potential to be highly flexible power source for electronics, capable of a very small 6 mm bending radius (e.g. smaller than average adult human finger).

Bending strain is one of the main movements that induces cracks on functional thin films leading to malfunction of flexible electronics. After 2000 bending cycles, the battery ink layer on the textile device was inspected and no visible cracks were present. Voltage output was measured for a two hour period prior to bending and for two hours after bending with minimal change in voltage occurring over the comparative periods.

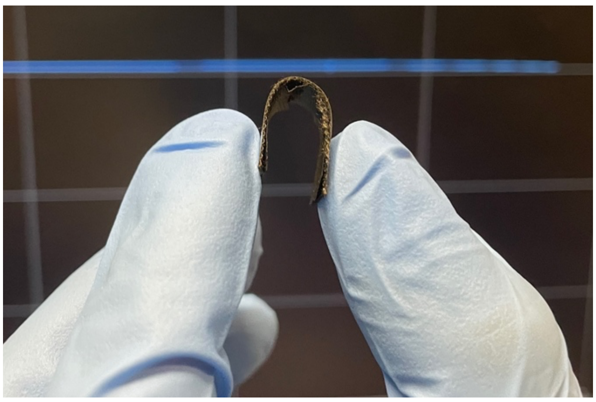
Flexible Self-Charging Battery Technology
The self-charging battery ink technology generates electricity from humidity in the air or skin surface. It is being developed under a collaboration partially funded by a Federal Government grant with CSIRO and the University of New South Wales[1].

The technology is being designed to be a hybrid electric generator - battery cell fabricated with a printable ink. Development to date has been focused on **voltage** and the ability to **harvest energy** from humidity in the air. The mechanical **flexibility** testing results demonstrate another potential competitive advantage of the technology over current battery technologies that are bulky and rigid.

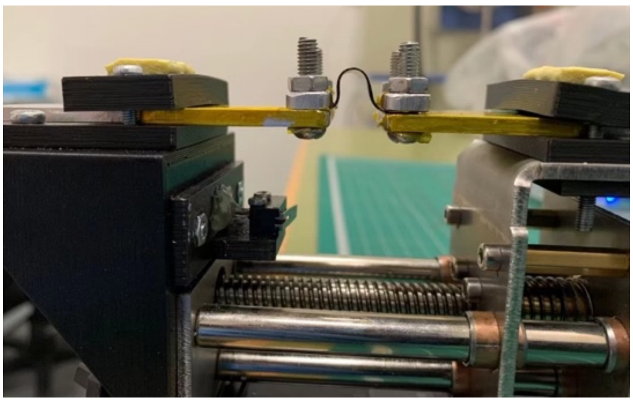
The ability for the high humidity levels of the human skin to be harvested by Battery ink cells and need for a less bulky and flexible power source make the electronic skin patch sector a natural fit for the Battery ink technology. Flexible skin patches are wearable products that have integrated electronic components such as sensors are attached to the surface of the skin. The sector produced USD 10 billion in revenue in 2019 and notwithstanding the bulk and rigidness limitations of current batteries and is forecast to grow to nearly USD 40 billion by 2030[2] technology.

Likewise environmental and infrastructure sensors are designed to be built on plastic, glass or wrapped around other curved surfaces require a power source that can conform to curved or flexible surfaces and are also attractive initial user applications. Thus, the initial market focus is on wearables and IoT related devices such as cosmetic, pressure, environmental and health (e.g. diabetes or cardiovascular monitoring) as they have lower energy output requirements. Higher performance applications will include development of a capacitor for energy storage/regulation and focused on at a later date.

Battery Ink on Carbon Cloth



Mechanical Flexibility Testing



Mechanical Flexibility Testing
To assess the mechanical flexibility of the battery ink textile prototype, a programmable linear motion stage was used to systematically input bending strain on the device to simulate the device being bent. The open circuit voltage of the textile device before being conducting the flexibility testing was measured for 2 hours to establish a baseline performance voltage output.

To begin the flexibility testing, both ends of the textile prototype was fixed onto two platforms on the linear motion stage, one platform is fixed and the other platform is dynamically moving in a controlled horizontal motion. For a single bending cycle, the mobile platform will move towards the fixed platform until it reaches a programmed distance and it will then move back to its original position. UNSW conducted 2000 bending cycles for the textile prototype device using the programmable linear motion stage. The linear motion stage was programmed to simulate a bending radius of 5.85mm on the textile device for 2000 bending cycles at a bending rate of 10mm/s. After completion of the flexibility testing, open circuit voltage of the textile device was measured again for 2 hours and performance was compared to the voltage output pre-flexibility testing.

On an alternate testing method, open circuit voltage output of another textile device was measured for 2 hours before flexibility testing was conducted. The textile device was then subjected to 1000 bending cycles using the programmable linear motion stage. The device was tested again for open circuit voltage for 2 hours. The textile device was subjected to a further 1000 bending cycles, a total of 2000 bending cycles. The open circuit voltage output was measured again for 2 hours after the additional 1000 bending cycles.

Mechanical Flexibility Testing Results
Before the textile device was subjected to bending cycles, open circuit voltage output of the device was measured for 2 hours and it was generating a constant voltage of approx. 0.7 Volts. After continuous 2000 bending cycles, the battery ink layer on the textile device was visually inspected and no visible cracks were present. The open circuit voltage output was then measured for 2 hours and the textile device voltage output remained approximately constant before and after mechanical bending cycles.

On an alternate testing method, open circuit voltage output pre-flexibility testing was measured for 2 hours and showing a stable open circuit voltage output of 0.7 Volts. After the first 1000 bending cycles, open circuit voltage of the device was measured for 2 hours and voltage output remained stable. As the device showed no degradation for the first 1000 bending cycles, the device was subjected to a further 1000 bending cycles, a total of 2000 bending cycles. The open circuit voltage output was measured for 2 hours and a similar voltage output was achieved. Hence, after a total of 2000 bending cycles, the device showed stable open circuit voltage performance.

Further Development
Early results from UNSW on textile material demonstrates the Battery Ink has a very small bending radius and is a potential power source for current and future flexible electronics. **The next steps in mechanical flexibility will involve increasing power output beyond the comparative time period used to date and further optimisation of the fabrication and adhesion properties of the battery ink on other flexible substrates such as plastic.**

The Company is currently attempting to develop Battery Ink cells up to four times smaller than existing Battery Ink cells. This would demonstrate the potential of the technology to be scaled down in size and open up potential for scaling down even further. Smaller batteries serially connected can create more power output from the space available within an electronic device. They can also provide ever smaller and lighter devices with an alternate power source.

Further information regarding future milestones and timeframes relating to overall forward looking Battery Ink technology development will be released when the outcome of the battery size reduction development program has been received and assessed by the Company.

About Strategic Elements
The Australian Federal Government has registered Strategic Elements as a Pooled Development Fund with a mandate to back Australian innovation. The Company operates as a venture builder where it generates high risk-high reward ventures and projects from combining teams of leading scientists or innovators. Investors in SOR potentially pay no tax on capital gains from selling their SOR shares as the Company operates under the Pooled Development program setup to encourage investment into innovation.

Through its 100% owned subsidiaries the Company is:

- Collaborating with giant US Fortune 100 Company Honeywell to build autonomous robotic security vehicles for the correctional justice sector. (announced 16/10/2020)
- Collaborating with the Australian Herbicide Resistance Initiative on applying autonomous technologies to agriculture. (announced 19/10/2020)
- Is working with CSIRO and has licensed world leading CSIRO technology that enables robots to work together in teams. (announced 12/11/2020)
- Developing printable electronic inks for neuromorphic computing and RRAM memory applications under a grant with the University of New South Wales and CSIRO. (announced 30/12/2020)
- Developing a self-charging electrical generator battery technology under a grant with University of New South Wales and CSIRO. (announced 01/12/2020)

More information on the Pooled Development Program is available on the Company's website. The Company is listed on the ASX under the code "SOR".

For Company Information: Mr Charles Murphy, Managing Director Phone: +61 8 9278 2788
admin@strategicelements.com.au www.strategicelements.com.au

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

[1]*announced 30/7/20*
[2]*https://www.idtechex.com/en/research-report/electronic-skin-patches-2020-2030/743* 2