RECONFIGURABLE SOFT LI-ION BATTERY

Tech ID: 32455 / UC Case 2022-002-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20240332613	10/03/2024	2022-002

BRIEF DESCRIPTION

The invention is flexible/stretchable soft battery for devices that seamlessly integrate for human-machine interface applications. Such reconfigurable and soft batteries will play an important role as power sources can take up a large space in a system. To this end, the conformable/stretchable batteries of the embodiments provide an ideal power sources for these devices. Wearable devices attract lots of interest with a market share of over $116.2 billion/year, projected to be $265.4 billion by 2026

SUGGESTED USES

The medical and healthcare sectors will also benefit from such an invention. Driven by recent development in big data and machine learning, the digital healthcare market has grown rapidly in recent years due to its potential to provide smooth healthcare functions to individuals with an estimated market size of US $116.39 billion now and projected to grow to $833.44 by 2027. Systems that are compliant with changes of human body without limiting the mobility of individuals are desirable and reconfigurable soft batteries will be indispensable in those systems.

ADVANTAGES

The invention is an innovation to circumvent the problems with existing soft batteries, including the usage of a non-toxic, aqueous hydrogel electrolyte instead of organic electrolytes. The hydrogel electrolyte is shown to: 1) enable highly safe operations due to its non-toxic nature; 2) alleviate the moisture penetration problem from outside environment; (3) have a high-voltage working window (~2.77 V) for high energy density batteries; and (4) allow the construction of reconfigurable and soft batteries by using elastic polymer packaging materials instead of rigid hermetic seals. In the prototype tests, fabricated batteries have shown ultrahigh stretchability and flexibility, radius of curvature less than 2 mm, to enable conformal attachments to a wide range of geometric surfaces as reconfigurable batteries. Remarkably, the prototype battery also shows outstanding cyclic stability and to retain ~90% of capacity after 100 cycles for over 2 months in the ambient environment without using any rigid hermetic sealing package. Furthermore, the preliminary data, without device optimizations, on the specific energy density is measured as high as 1.5 mAh/cm^3, without further optimizing. Since a roll-to-roll manufacturing process could be readily setup to fabricate this soft battery for large-scale production to lower the manufacturing cost, it is believed this technology is an excellent fit as the solution for the safe, printable, and conformal batteries for wearable electronic devices. After optimization in materials and system, packaging designs, and large-scale manufacturing, the embodiments could potentially address the needs for commercial and military applications, including but not limited to warfighters as well as to attract funding from sectors of consumer electronics and medical/healthcare devices such as the next generation wearable electronics systems.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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OTHER INFORMATION

KEYWORDS

soft batteries

CATEGORIZED AS

» **Materials & Chemicals**

» Electronics Packaging

» Storage

RELATED CASES

2022-002-0

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