



FULLY BIODEGRADABLE SUPERCAPACITOR

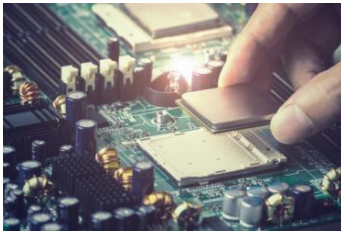
Affiliation : Korea university

Type of Partnership : Open for negotiation

Cost : Open for negotiation

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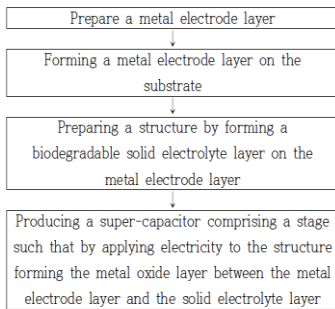
Abstract

It is possible to provide a super capacitor of high capacity, high energy and high power. In addition, it can be implanted into environmentally friendly, biodegradable, biocompatible and used in the future biological portable energy storage device.

Problems with Existing Technology

It has been proposed in order to solve the environmental issue of using energy storage system and harmfulness to humanity.

- The conventional environmentally friendly batteries can be dissolved and are composed of materials which is not harmful to the body. However it has a low driving voltage per cells and drawbacks such as a fast dissolution rate of the components.
- Super capacitor which is called as next-generation energy storage device has the advantages of rapid charging and discharging speed, high output, and excellent long-life characteristics, safety of the material than the existing batteries. Therefore, it is required to improve the biodegradable super capacitors.



<A flow chart showing the manufacturing method of the super capacitor>

Technology Readiness Level

TRL 3 : Experimental Proof of Concept

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Basic Technology Research	Technology Concept formulated	Experimental Proof of Concept	Technology validated in lab	Technology validated in relevant environment	Technology demonstrated in relevant environment	System Prototype in operational environment	System complete & qualified	Full commercial application

Differentiation and Effect

Differentiation

Manufacturing a biodegradable supercapacitor through a feature of structure material.

- It includes the flexible substrates comprising a biodegradable polymer (polylactic acid-glycolic acid copolymer, a bio-cellulose, polyglycolic acid, polylactic acid), the electrode layer and the solid electrolyte layer.
- It includes a biodegradable encapsulant coating the substrate, the electrode layer and the solid electrolyte layer.

Effect of Technology

It can provide a super capacitor of high capacity, high energy and high power

- It can be manufactured high-performance of the supercapacitor than the present eco-friendly batteries.

Environmentally friendly energy storage device

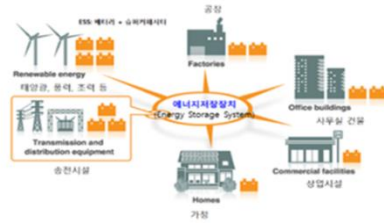
- It can be implanted into environmentally friendly, biodegradable and biocompatible, and it can be implemented in the future biological portable energy storage device.



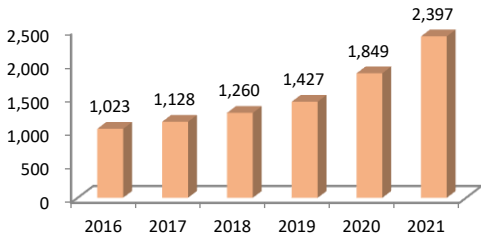
Fully Biodegradable Supercapacitor

Technology Application Field

It can be used in various fields such as energy storage system(ESS), electronic information devices, transport machines, robots, and industries



Market Trends



The strategy of spreading energy industry 2030

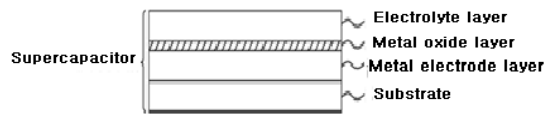
<Prospects of global energy storage market, billion USD>

- Global new energy market reached USD 102 billion and is expected to reach USD 239 billion by 2021 with the average growth rate of 29.6%.
- According to global climate change strategy of IEA, it is expected to expand into the industry such as renewable energy, energy efficiency by 2030 with the investment of USD 12 trillion.

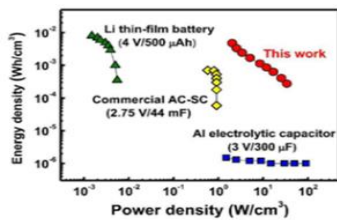
Technology Implementation

Manufacturing method of a fully biodegradable supercapacitor

- Forming a metal electrode layer on a substrate having a biodegradable polymer.
- Preparing a structure by forming a biodegradable solid electrolyte layer on the metal electrode layer.
- Forming the metal electrode layer by applying electricity to the structure and the solid electrolyte layer is provided between the metal oxide layer.



< A cross-sectional view of a supercapacitor >



<The comparison between supercapacitor and present ESS system>

Comparison of Energy densities

- If we indicate the energy density and the output density of the conventional energy storage device and the present invention with Ragon plot, we can see that it has a high voltage range and the energy density.

List of related patents

No.	Title of Invention	Patent No./ Application No.
1	FULLY BIODEGRADABLE SUPERCAPACITOR AND METHOD FOR MANUFACTURING SAME	PCT/KR2017/015133