

Presentation Topic

“LITHIUM-ION BATTERY”

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(NBA and NAAC accredited, ISO 9001:2015 certified)

Title : “LITHIUM-ION BATTERY”

- **Applicant Details:** CRP SERVICES.R.I., Modena (IT)
- **Inventor:** Zhenhua Mao (US)., Anaba Anani (US).
- **Assignee:** Motorola, Inc (US)..
- **Application No:** 09/727,730
- **Filed:** Dec. 1, 2000
- **Publication No:** US 6,617,075 B2
- **Publication Date:** Sep. 9, 2003



US006617075B2

Subject of a Patent: LITHIUM-ION BATTERY

- This invention relates generally to electricity-producing batteries and their construction.
- More particularly, this invention relates to electrode and electrolyte compositions for lithium-ion and lithium polymer batteries that improve capacity-fade resistance characteristics of the battery.

Importance of this Patent

- The need for higher energy and power is becoming increasingly valuable in most portable applications as manufacturers continue to incorporate more features in their products.
- End users continue to also demand longer operation times as well as longer life. These demands and features place a very Strong requirement on the Storage energy and cycle life characteristics of the associated energy Source.

Marketing Benefit:

Low cost, low-self discharge rate, and minimal installation space are some of the key factors driving the adoption of Li-ion batteries in smart grid and energy storage systems. Since these batteries are more resistant to high temperatures, they are ideal for use in remote areas and thermal control applications.

- **Market Overview:**

The global lithium-ion battery market size was USD 45.70 Billion in 2022 and is expected to register a revenue CAGR of 13.1% during the forecast period.

- **Revenue Source:**

The consumer electronics segment was the largest revenue share in 2021. Batteries can be found in both consumer electronics and portable electronics. Smartphones, tablets, computers and smartphones all have batteries. The CAGR for the consumer electronics segment is high during the forecast period.

- **Most Common Pitfalls:**

Li-ion batteries require safety mechanisms to limit voltage and internal pressures, which can increase weight and limit performance in some cases. Li-ion batteries are also subject to aging, meaning that they can lose capacity and frequently fail after a number of years.

Novelty / Uniqueness

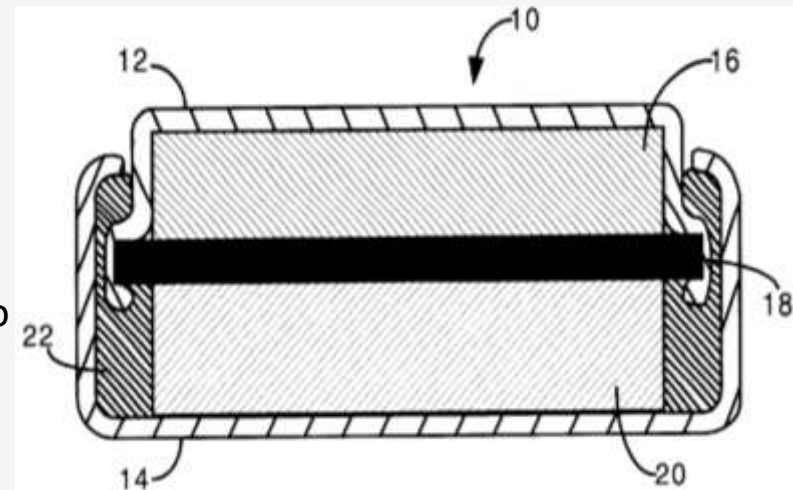
- Lithium-based battery cells are an attractive energy Source for portable applications, due in part to their ability to provide relatively high energies and long cycle life.
- Lithium is the lightest of all the metals, with a high electrochemical potential, thus providing high energy densities. Rechargeable batteries using lithium as the electrochemical material are capable of providing higher energy to weight ratio than those using other chemistries.
- After repeated charges and discharges of a Li-polymer battery with a **PVDF gel electrolyte**, the overall capacity of the Li-polymer battery to hold an adequate charge fades. This quality is disadvantageous in a battery because the battery will very quickly cease to provide a functional charge to a host device, Such as a cellular telephone.

Utility/Industrial Application

- Presently, the main application of rechargeable Li-ion batteries is in portable electronic devices, such as cellular phones, digital cameras, global positioning system devices, tablets, and laptop computers.
- Lithium-ion batteries (LIBs) feature **high energy density, high discharge power, and long service life**. These characteristics facilitated a remarkable advance in portable electronics technology and the spread of information technology devices throughout society.

DETAILED DESCRIPTION OF THE INVENTION

- lithium-polymer battery **10** having an upper component **12** and a lower component **14**, which are constructed of a conductive material. However, the battery **10** can be constructed in any Li-ion configuration as is known in the art. Within the upper component **12** is an anode **16**, and within lower component **14** is a cathode **20**, with separator **18** between anode **16** and cathode **20**. The insulator **22** insures that the anode **16** is only in conductive connection with the upper component **12**, and the cathode **20** is in conductive connection with the lower component **14** whereby conductive contact with both the upper component **12** and lower component **14** will close a circuit and allow current to flow due to the electrochemical reaction of the anode **16** and cathode **20**.



- The separator **18** between the anode **16** and cathode **20** is coated with PVDF such that the anode **16**, cathode **20**, and separator **18** are held together when the electrolyte and PVDF is gelled by temperature curing, as is known in the art.
- The operation voltage window of the battery using the above component; is in a range of 2.5 to 4.1 volts. Furthermore, a Li-polymer battery constructed with above design has a charging cycle-life of over 300 cycles.

Claims:

- A lithium-ion battery, the battery comprising:

An anode comprised of at least carbon and has a density being in a range from 1.2 to 1.5 g/cm. A cathode comprised of LiNiO_2 , the cathode density being in a range from 3.0 to 3.3 g/cm³. An electrolyte, and a separator between the anode and cathode, the Separator coated with PVDF Such that the anode, cathode, and Separator are held together, wherein the ratio by weight of active LiNiO to active carbon present in the battery cathode and anode respectively is no greater than 2.0 to 1.

- The battery of claimed, wherein the lithium-ion battery is a lithium-polymer battery.
- The battery in claim 1, wherein the operating Voltage window is between 2.5V to 4.1V.
- The battery of claim 1, wherein: the anode has a density of 1.4 g/cm; and the cathode has a density of 3.1 g/cm;
- . A lithium-ion battery, the battery comprising: an anode, a cathode; an electrolyte, and a separator between the anode and cathode, the Separator coated with PVDF Such that the anode, cathode, and Separator are held together;

Conclusion

- While the preferred embodiments of the invention have been illustrated and described, it is clear that the invention is not So limited. Numerous modifications, changes, variations, Substitutions, and equivalents will occur to those skilled in the art without departing from the Spirit and Scope of the present invention as defined by the following claims.

Thank You