

# A Comprehensive Guide to Primary and Secondary Batteries

Alexa Stephe<sup>\*</sup>

Department of Applied Sciences, Tishreen University, Latakia, Syria

## Commentary

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**\*For Correspondence:**

Alexa Stephe, Department of  
Applied Sciences, Tishreen  
University, Latakia, Syria

**E-mail:** sultan.a@co.vn

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### ABOUT THE STUDY

A battery is an electric power source that consists of one or more electrochemical cells with external connections to power electrical equipment. When a battery is delivering electricity, the positive terminal is referred to as the cathode and the negative end is referred to as the anode. The negative terminal is the source of electrons that will flow to the positive terminal through an external electric circuit. When a battery is linked to an external electric load, a redox reaction occurs in which high energy reactants are converted to lower energy products, and the free energy difference is provided to the external circuit as electrical energy. Historically, the term battery referred to a device made up of numerous cells. However, the phrase has come to apply to devices made up of a single cell. Because the electrode materials are permanently modified after discharge, primary single use or disposable batteries are used once and destroyed, an example is the alkaline battery used in flashlights and a variety of portable electronic gadgets. Secondary rechargeable batteries can be drained and recharged several times with an applied electric current, reverse current can be used to restore the original composition of the electrodes. Lead acid batteries used in automobiles and lithium ion batteries used in portable gadgets such as laptops and mobile phones are two examples.

Batteries exist in a variety of forms and sizes, ranging from tiny cells used to power hearing aids and wristwatches to massive battery banks the size of rooms that supply standby or emergency power for phone exchanges and computer data centres. Battery specific energy per unit mass is substantially lower than that of popular fuels such as petrol. In autos, this is largely compensated by electric motors superior efficiency in transferring electrical energy to mechanical work as compared to combustion engines.

### Primary and secondary batteries

Batteries are divided into two types; primary batteries and secondary batteries. Some main batteries, such as those used in telegraph circuits, were returned to use by changing the electrodes. Secondary batteries cannot be recharged indefinitely owing to active material dissipation, electrolyte loss and internal corrosion.

**Primary batteries:** Primary cells can generate current immediately after being assembled. These are most typically employed in portable devices with low current consumption, that are only used occasionally or that are utilised far away from another power source, such as alarm and communication circuits when other electric power is only accessible periodically. Because chemical processes are not easily reversible and active components may not return to their original forms, disposable primary cells cannot be recharged reliably. Manufacturers advise against attempting to recharge primary cells. In general, they have better energy densities than rechargeable batteries, but they do not perform well in high drain applications with loads less than 75 ohms ( $\Omega$ ). Zinc-carbon batteries and alkaline batteries are two common types of disposable batteries.

**Secondary batteries:** Secondary cells, or rechargeable batteries, must be charged before use; they are often built with active components that are discharged. Electric current is used to recharge rechargeable batteries, which reverses the chemical processes that occur during discharge. Chargers are devices that provide the necessary current. The lead-acid battery is the most traditional type of rechargeable battery, and it is widely utilised in automotive and marine applications. This technique uses an open container for liquid electrolyte, therefore the battery must be kept upright and the environment sufficiently aired to enable safe dispersal of the hydrogen gas produced during overcharging. For the quantity of electrical energy it can provide, the lead-acid battery is relatively hefty. Its low production cost and strong surge current levels make it popular in applications where capacity more than 10 Ah is more critical than weight and handling concerns. A popular use is the contemporary vehicle battery, which can generate a peak current of 450 amperes (A) in most cases.