Lithium vs Alkaline Batteries Comparison Analysis

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Lithium ion batteries andAlkaline Batteries are the two best choices in today’s market. Both types of batteries provide reliable power output. To select the most suitable battery for your device, it is best to have a basic understanding of these two types of batteries. This article will discuss the differences, Lithium vsAlkaline Batteries.

The different materials determine the performance differences between lithium-ion batteries and alkaline batteries. There are various types of lithium-ion batteries, including lithium iron phosphate (LiFePO4), lithium nickel cobalt manganese oxide (Li(NiCoMn)O2), lithium titanate (Li2TiO3), lithium cobalt oxide (LiCoO2), lithium manganese oxide (LiMn2O4), lithium nickel oxide (LiNiO), etc.

Among them, Ternary Lithium-ion Battery and lithium iron phosphate Battery are commonly used in electric vehicles. There are also non-rechargeable lithium batteries with metallic lithium as the material, while lithium-ion batteries are rechargeable.

Alkaline batteries are successful high-capacity batteries known for their cost-effectiveness. Alkaline batteries use manganese dioxide (MnO2) as the cathode material, zinc (Zn) as the anode material, and potassium hydroxide (KOH) as the electrolyte. In a typical alkaline battery with an alkaline electrolyte, the chemical reaction between Zn and MnO2 generates energy.

Alkaline batteries come in various sizes including 9V, AAA, AA, C, D, and coin cell batteries. Among them, AA alkaline batteries have the same size as 14500 lithium-ion batteries.

Cylindrical-shaped lithium-ion batteries include 18650 batteries, 14500 batteries, 26650 batteries, 21700 batteries, 32650 batteries, etc. Tesla is also set to release a new battery called the 4680 Battery.

Alkaline batteries have lower material costs, resulting in lower purchase costs compared to lithium-ion batteries. However, alkaline batteries can only be replaced once their power is depleted, making the overall cost higher.

In contrast, lithium-ion batteries have a longer lifespan. While the upfront purchase cost of lithium-ion batteries may be approximately three times that of alkaline batteries, their overall cost of use is lower, as they can be recharged and used multiple times.

Alkaline batteries have a voltage of 1.5V, non-rechargeable lithium batteries have a voltage range of 1.5V to 3.0V, and rechargeable lithium-ion batteries typically have a voltage range of 3.2V to 3.7V. Lithium batteries can be combined to form more powerful battery packs such as 12V, 48V, and even high-voltage battery packs.

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The capacity of alkaline batteries is typically around 1800-2800mAh. Alkaline batteries have a lower capacity compared to low-drain, high-frequency devices. As the current increases, the capacity of alkaline batteries drops significantly. In contrast, lithium batteries only experience a slight decrease in capacity.

Different types of lithium batteries have varying capacity ranges such as 1200mAh, 2200mAh, 3500mAh, 5500mAh, etc. Lithium batteries have a lower self-discharge rate and higher capacity. They also have a higher energy density, meaning that they can have many times the capacity of alkaline batteries of the same size.

Alkaline batteries can be stored for up to 10 years in suitable temperature conditions, while lithium batteries can be stored for up to 20 years. However, both alkaline and lithium batteries will experience self-discharge over time. It is important to store batteries with some remaining charge, as a completely discharged battery is considered non-functional.

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