Nickel Cadmium:

A rechargeable type battery using nickel oxide hydroxide and metallic cadmium as electrodes. Disclaimer: The abbreviation *NiCad* is a registered trademark of SAFT Corporation and should not be used to refer generically to nickel-cadmium batteries, although this brand-name is commonly used to describe all nickel-cadmium batteries. On the other hand, the abbreviation *NiCd* is derived from the chemical symbols of nickel (Ni) and cadmium (Cd), though it is not to be confused with a chemical formula. There are two types of NiCd batteries: sealed and vented. The first nickel-cadmium battery was created by Waldemar Jungner of Sweden in 1899.

Nickel Metallic Hydride:

abbreviated **NiMH**, is a type of rechargeable battery similar to a nickel-cadmium (NiCd) battery but using a hydrogen-absorbing alloy for the negative electrode instead of cadmium. As in NiCd batteries, the positive electrode is nickel oxyhydroxide (NiOOH). A NiMH battery can have two to three times the capacity of an equivalent size NiCd. However, compared to the lithium-ion battery, the volumetric energy density is lower and self-discharge is higher. Recently, Nickel-Metal Hydride (Ni-MH) and lithium ion batteries (Li-ion) have become more commercially available and cheaper, the former type now rivaling Ni-Cds in cost. Where energy density is important, Ni-Cds batteries are now at a distinct disadvantage over Ni-MH and Li-ion batteries. This and environmental considerations have largely relegated the Ni-Cd construction to history. However, the Ni-Cd battery is still very useful in applications requiring very high discharge rates because the Ni-Cd can endure such discharge with no damage or loss of capacity.

Nickel (Fe):

nickel-iron battery is a storage battery having a nickel(III) oxide-hydroxide cathode and an iron anode, with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets. The nominal cell voltage is 1.2V. It is a very robust battery which is tolerant of abuse, (overcharge, over discharge, short-circuiting and thermal shock) and can have very long life even if so treated. It is often used in backup situations where it can be continuously charged and can last for more than 20 years. Nickel-iron batteries have long been used in European mining operations because of their ability to withstand vibrations, high temperatures and other physical stress. They are being examined again for use in wind and solar power systems and for modern electric vehicle applications. It is a battery that lasts for decades and in many cases can outlast the equipment that it was originally designed to power. So from an economic standpoint lead acid, NiCd and other technologies have been deemed "good enough" and are the predominant technologies in use today even though they do not last as long as a Nickel/Iron counterpart.

Sodium Sulfur:

type of battery constructed from sodium (Na) and sulfur (S). This type of battery has a high energy density, high efficiency of charge/discharge (89—92%) and long cycle life, and is fabricated from inexpensive materials. Because, however, of the operating temperatures of 300 to 350 °C and the highly corrosive nature of the sodium polysulfides, such cells are primarily suitable for large-scale non-mobile applications such as grid energy storage.

Sodium Nickel Chloride:

molten salt batteries are a class of primary cell and secondary cell high temperature electric battery that use molten salts as an electrolyte. They offer both a higher energy density through the proper selection of reactant pairs as well as a higher power density by means of a high conductivity molten salt electrolyte. They are used in services where high energy density and high power density are required. These features make rechargeable molten salt batteries a promising technology for powering electric vehicles and many hybrid vehicles currently utilize this battery. Operating temperatures of 400 to 700°C, however, bring problems of thermal management and safety, and place more stringent requirements on the rest of the battery components. Some newer designs operate at a lower temperature range of 270–350 °C.

Lithium Polymer:

Lithium-ion polymer batteries, polymer lithium ion, or more commonly lithium polymer batteries (abbreviated Li-poly, Li-Pol, LiPo, LIP, PLI or LiP) are rechargeable batteries which have technologically evolved from lithium-ion batteries. Ultimately, the lithium-salt electrolyte is not held in an organic solvent as in the lithium-ion design, but in a solid polymer composite such as polyethylene oxide or polyacrylonitrile. The advantages of Li-poly over the lithium-ion design include lower cost manufacturing and being more robust to physical damage. Lithium-ion polymer batteries started appearing in consumer electronics around 1996.

Lithium Iron Disulfide:

Unlike other lithium cells that have chemistries tuned to obtaining the greatest capacity in a given package, lithium-iron disulfide cells are a compromise. To match to existing equipment and circuits, their chemistry has been tailored to the standard nominal 1.5-volt output (whereas other lithium technologies produce double that). These cells are consequently sometimes termed *voltage-compatible lithium* batteries. Unlike other lithium technologies, lithium-iron disulfide cells are not rechargeable. Internally, the lithium-iron disulfide cell is a sandwich of a lithium anode, a separator, and iron disulfide cathode with an aluminum cathode collector. The cells are sealed but vented.

Lithium Aluminum Disulfide:

A rechargeable lithium aluminum/iron sulfide battery has been built and tested. Prismatic LiAl/FeS cells provide a delivered energy to 80% depth of discharge (DOD) of 217 Wh/1 and a peak power of 375 W/l. Cycle life of over 365 cycles was achieved at the C/3 rate. Pulse self-discharge and driving cycle tests were also performed for an electric vehicle application. The molten salt electrolyte requires an operational temperature of about 450°C. A thermal control system composed of heating elements, thermal enclosure, and heat exchanger was engineered and tested. The components for a 8 kWh battery were developed and evaluated. This high temperature rechargeable battery is suitable for applications requiring high specific energy and minimal volume.

Lithium Ion:

type of rechargeable battery in which a lithium ion moves between the anode and cathode. The lithium ion moves from the anode to the cathode during discharge and from the cathode to the anode when charging. Lithium ion batteries are commonly used in consumer electronics. They are currently one of the most popular types of battery for portable electronics, with one of the best energy-to-weight ratios, no memory effect, and a slow loss of charge when not in use. Lithium ion batteries are not to be confused with lithium batteries, the key difference being that lithium batteries are primary batteries containing metallic lithium while lithium-ion batteries are secondary batteries containing an intercalation anode material.

Metal-Air:

(non-rechargeable), and **zinc-air fuel cells,** (mechanically-rechargeable) are electro-chemical batteries powered by the oxidation of zinc with oxygen from the air. These batteries have high energy densities and are relatively inexpensive to produce. They are used in hearing aids and in experimental electric vehicles. They may be an important part of a future zinc economy.

The term **zinc-air fuel cell** usually refers to a zinc-air battery in which zinc fuel is replenished and zinc oxide waste is removed continuously. This is accomplished by pushing zinc electrolyte paste or pellets into an anode chamber. Waste zinc oxide is pumped into a waste tank or bladder inside the fuel tank, and fresh zinc paste or pellets are taken from the fuel tank. The zinc oxide waste is pumped out at a refueling station and sent to a recycling plant. Alternatively, this term may refer to an electro-chemical system in which zinc is used as a co-reactant to assist the reformation of hydrocarbon fuels on an anode of a fuel cell.

Aluminum-air batteries:

or Al-air batteries, since they produce electricity from the reaction of oxygen in the air with aluminum. They have the highest energy density of all batteries, but they are not widely used because of previous problems with cost, shelf-life, start-up time and byproduct removal, which have restricted their use to mainly military applications. An electric vehicle with aluminum batteries could have potentially ten to fifteen times the range of lead-acid batteries with a far smaller total weight. Al-air are primary batteries, i.e., non-rechargeable, and can also be considered to be fuel cells. Once the aluminum anode is consumed by its reaction with atmospheric oxygen at a cathode immersed in a water-based electrolyte to form hydrated aluminum oxide, the battery will no longer produce electricity. However, it may be possible to mechanically recharge the battery with new aluminum anodes made from recycling the hydrated aluminum oxide. In fact, recycling the formed aluminum oxide will be essential if aluminum air batteries are to be