

Lithium-iron Batteries – LiFePO4

A lithium-ion battery (a.k.a Li-ion) is rechargeable kind of battery with lithium cobalt dioxide (LiCoO₂) or lithium manganese oxide (LiMn₂O₄) as a cathode. On the other hand, a lithium-iron battery is also a rechargeable type of battery but made with lithium iron phosphate (LiFePO₄) as the cathode material. Generally, anodes are made up of carbon in both batteries. Actually lithium-iron is a newer version in the lithium battery family.

The low discharge rate in idle state and high energy density make lithium batteries suitable for consumer electronics devices such as laptops, cameras, portable DVD players, etc. These days these batteries are also finding good applications in electric vehicles and military appliances.

Safety

Safety is the first concern for any battery being used in portable devices. It should not get overheated or catch fire in case of overcharging. The Lithium-iron battery has edge over the Li-ion battery in such situations. It has superior chemical and thermal stability. A Lithium-iron battery remains cool at room temperature while the Li-ion may suffer thermal runaway and heats up faster under similar charging conditions. LiFePO₄ is a nontoxic material, but LiCoO₂ is hazardous in nature, so is not considered a safe material. Lithium cobalt dioxide is an allergen to eyes and skin. It could cause a major harm if swallowed. Disposal of Li-ion battery is a big concern for the manufacturer and user.

Performance

Performance is a major criteria to choose a suitable battery for an application. Long life, slow discharge rate and less weight should be basic features of a daily use battery. Lithium iron batteries are slightly heavier and more bulky in size than Lithium ion batteries. For this reason Li-iron is more commonly used for portable devices. The discharge rate of a Li-ion battery keeps increasing over the time as compared to Li-iron. But a brand new Li-ion battery has more energy density than a Lithium-iron battery and thus delivers better performance for a few initial days.

Durability, Reliability, and Cost Effectiveness

Battery life is defined by the number of charge/discharge cycles a battery can survive. Li-iron is more durable than Li-ion as the former lasts for around 2000 charge/discharge cycles while the later survives up to 1000 cycles. When not in use, a battery should not lose its charge at a faster rate. It should deliver almost same performance if using after a year or so. This so called shelf life is around 350 days for lithium-iron and about 300 days for a lithium-ion battery. Cobalt is more expensive than the iron and phosphate used in Li-iron. So the lithium-iron phosphate battery costs less (safer materials make it less expensive to manufacture and to recycle) to the consumer than the lithium-ion battery.