Nickel metal hydride battery

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A nickel-metal hydride battery (NiMH or Ni-MH) is a type of rechargeable battery. The chemical reaction at the positive electrode is similar to that of the nickel-cadmium cell (NiCd), with both using nickel oxide hydroxide (NiOOH). However, the negative electrodes use a hydrogen-absorbing alloy instead of cadmium. NiMH batteries can have two to three times the capacity of NiCd batteries of the same size, with significantly higher energy density, although only about half that of lithium-ion batteries.[6]

They are typically used as a substitute for similarly shaped non-rechargeable alkaline batteries, as they feature a slightly lower but generally compatible cell voltage and are less prone to leaking.[7][8]

In 1998, Stanford Ovshinsky at Ovonic Battery Co., which had been working on MH-NiOOH batteries since mid-1980,[12] improved the Ti-Ni alloy structure and composition and patented its innovations.[13]

About 22% of portable rechargeable batteries sold in Japan in 2010 were NiMH.[16] In Switzerland in 2009, the equivalent statistic was approximately 60%.[17] This percentage has fallen over time due to the increase in manufacture of lithium-ion batteries: in 2000, almost half of all portable rechargeable batteries sold in Japan were NiMH.[16]

In 2015 BASF produced a modified microstructure that helped make NiMH batteries more durable, in turn allowing changes to the cell design that saved considerable weight, allowing the specific energy to reach 140 watt-hours per kilogram.[18]

NiMH cells have an alkaline electrolyte, usually potassium hydroxide. The positive electrode is nickel hydroxide, and the negative electrode is hydrogen in the form of an interstitial metal hydride.[20] Hydrophilic polyolefin nonwovens are used for separation.[21]

When fast-charging, it is advisable to charge the NiMH cells with a smart battery charger to avoid overcharging, which can damage cells.[22]

Panasonic"s handbook recommends that NiMH batteries on standby be charged by a lower duty cycle approach, where a pulse of a higher current is used whenever the battery"s voltage drops below 1.3 V. This can extend battery life and use less energy.[22]

A resettable fuse in series with the cell, particularly of the bimetallic strip type, increases safety. This fuse opens if either the current or the temperature gets too high.[23]

However, this only works with overcharging currents of up to 0.1 C (that is, nominal capacity divided by ten hours). This reaction causes batteries to heat, ending the charging process.[23]

One inherent risk with NiMH chemistry is that overcharging causes hydrogen gas to form, potentially rupturing the cell. Therefore, cells have a vent to release the gas in the event of serious overcharging.[24]

NiMH batteries are made of environmentally friendly materials.[25] The batteries contain only mildly toxic substances and are recyclable.[20]

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