

developed by Enfucell Inc. and Blue Spark Inc. The Enfucell battery, which is printed on a plastic substrate, is neither rechargeable nor flexible, while Stanford's paper battery is both. In addition, Stanford's battery has an energy density of 108 mWh/g and is only about 300 μm thick. Enfucell's battery, on the other hand, is more than twice as thick and has less than half the energy density of Stanford's battery, as shown in Figure 3, where the arrow indicates the improvement direction [3].

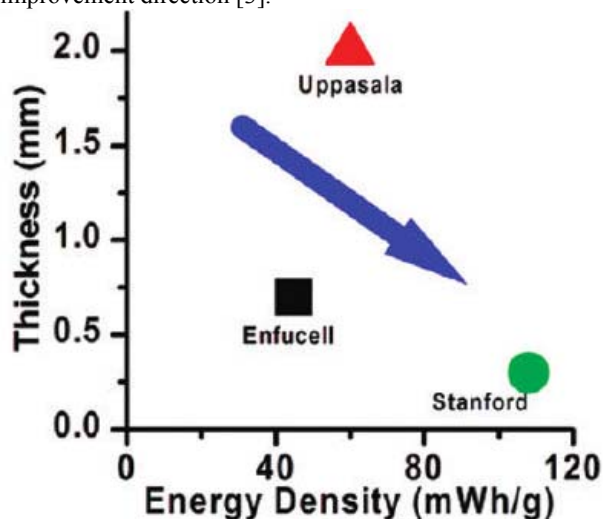


Figure 3: Energy density comparison graph [3]

14. Additional Advantages

Besides having obvious advantages over traditional batteries and having the potential to accelerate technology forward, the paper battery also has encouraging economical benefits. A common concern is that paper batteries would be too expensive to commercialize since carbon nanotubes, which are fairly expensive, are an essential component of the paper battery. However, while carbon nanotubes currently cost around \$200 per gram, paper batteries only need less than 0.2 milligrams of carbon nanotubes per square centimeter of battery. Therefore, the cost is only about two cents per square centimeter. This means that the cost of the carbon nanotubes for paper batteries is essentially negligible, making them a promising investment [3].

Finally, the paper battery is a significant technology because it has the potential to revolutionize the way we shop. Its aforementioned potential applications in cereal boxes and other food products and packaging could make even grocery shopping an exciting and interactive experience. Furthermore, the new method of purchase with the use of RFID tags would make shopping more time efficient by eliminating the need for a checkout counter, and the use of smart cards would give any shopper the ability to check their balance at any time.

15. Paper Batteries: Thin, Flexible Power

Because the paper battery offers an integrated design of the electrode and the electrolyte, the paper battery has many advantages over other batteries, including electrical efficiency and compactness. The flexibility gives the paper battery a mechanical advantage in that the battery can be fit to the electronic, instead of having to build the electronic

around the battery. Such advantages make the paper battery a good option for many applications such as smart cards and temperature monitors. As technology trends towards thinner electronics and electronic displays, the paper battery will play a larger role in small electronics. While the paper battery is still in a stage of research and development, it is clear that the paper battery will have significant impact on powering portable electronics in the future.

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