INTRODUCTION

The energy transition technology of tomorrow is here. Fast, efficient and environmentally friendly, NAWA Technologies’ pioneering innovations usher in a completely new way of harnessing and harvesting electricity.

Using carbon as our material of choice, combined with cutting edge nanotechnology, NAWA brings new possibilities to the world of energy storage. With our Ultra Fast Carbon Electrodes, we have completely disrupted the design of electrodes and energy storage technology, setting new standards for electric, thermal and ionic conductivity.

Thanks to this innovation, NAWA offers a range of Ultra Fast Carbon Batteries (UFCB) based on this revolutionary electrode technology. Capable of charging and discharging in seconds over one million times without any loss in performance, and able to operate in extremes of temperature, the UFCB also offers more power and energy than existing ultracapacitors, bridging the gap between ultracapacitors and lithium-ion cells.

Set to transform entire industries, from industry 4.0 to IOT, automotive to aerospace and even microelectronics to smart grids, this exciting new product is entering mass production at NAWA’s base in the south of France.

As well as being high performance, it is also clean. Because carbon is abundant, accessible and naturally occurring, the environmental impact of our manufacturing process is minimized and the life cycle of our products maximized through re-use, recovery and recycling.
At the heart of NAWA’s innovation – and the key to its next-generation energy storage – is a very special material: the vertically aligned carbon nanotube (VACNT).

Grown under specific controlled conditions pioneered by NAWA, these nanotubes are fine hair-like strands, each one standing on its end, incredibly thin yet incredibly long, making up a highly dense carpet. To this, NAWA can apply coatings that dramatically increase the structure’s energy density. By maximising the specific surface area available for the distribution of electrical charges (ions), more electricity can be stored more quickly.

Essentially, NAWA’s VACNT are the most conductive electrodes in the world, combining higher electrical and thermal conductivity (1000 times higher than powders) and ionic conductivity (ten times higher than in disordered powders) thanks to nano-confined straight channels in between the nanotubes.

The VACNT is a unique multifunctional material that has outstanding electrical, thermal, optical, ionic and fluidic properties. VACNT opens the door to numerous possibilities from new battery technologies to highly efficient thermal interface materials to yarns or wires, to name just a few.

This exceptionally high performing new material forms the basis of our Ultra Fast Carbon Electrode – and our entire range of energy storage products such as our Ultra Fast Carbon Battery.

These products can withstand the harshest conditions, from high and low temperatures to salty environments, yet suffer none of the thermal runaway problems associated with conventional batteries, making them safe and long lasting.

The Ultra Fast Carbon Electrode is a technology platform compatible with all kinds of chemistries from capacitors, ultracapacitors, batteries end even fuel cells.
NAWATechnologies is launching and developing a range of Ultra Fast Carbon batteries that bridge the gap between the world of ultracapacitors and that of conventional batteries with energy density that will range between 6 Wh/kg today to 30 Wh/kg in the near future. The first of which is a High Power Ultracapacitor, called NAWACap Power with a Power density (20-100 kW/kg) to address applications associated with electrical current needs.

In terms of usage, these Ultra Fast Carbon Batteries transform the popular notion that electricity storage is slow, inefficient and limited. Each Ultra Fast Carbon Battery can be charged in seconds across more than one million cycles, storing 100 times more energy than equivalent lithium or lead batteries throughout its service life.

By modulating the coating, NAWACAP ultracapacitors can be tuned for power or energy. For instance, NAWACAP POWER boasts ten times more power than existing technology and an ESR (Equivalent Serial Resistance) more than 10 times lower than competitors, with improved temperature and frequency behaviour. NAWACAP ENERGY, which is currently under development, will offer three-to-five times greater energy density than existing ultracapacitors, while retaining the similar power characteristics.

NAWA is also working on several other products, including capacitors, lithium-capacitors and lithium-ion batteries that use VACNT electrodes. The use of VACNT electrodes in batteries offers a variety of substantial benefits, simultaneously increasing a battery’s power, energy and safety, while also extending its lifetime.
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NAWATechnologies’ new Ultra Fast Carbon Batteries have multiple uses, from the power tool and manufacturing sectors to automotive and commercial vehicle markets, within the Internet-of-Things and sensor sectors as well as playing a key role in managing energy flow within a smart grid, to aerospace and even space.

The key to the technology’s diverse applications is partly thanks to a much lower total cost of ownership, due to increased service life and fewer required replacements. The system also significantly reduces the size and weight of a device’s energy storage system when compared to a conventional battery.

In the short term, NAWATechnologies’ new Ultra Fast Carbon Batteries offer two major solutions. As replacements for existing ultracapacitors, they enable faster charging of electricity. When combined with existing lithium-ion batteries – which boast greater energy density – or hydrogen fuel cells – that are not capable of harvesting energy at all – they can provide more power and extend a product’s lifetime.

In the long term, the possibilities offered by NAWATechnologies’ Ultra Fast Carbon Battery could enable the company to develop hybrid ultracapacitor cells. With energy densities approaching those of lead acid batteries but with much faster charging times, these cells would lower overall battery pack weight and extend service life, ideal for use in automotive, wider mobility and renewable energy sectors.
THE PATH TO MASS PRODUCTION

It’s one thing to pioneer an entirely new type of material, quite another to produce it in large numbers. But NAWA Technologies is doing just that and making this technology available to industry.

In the five years since the first round of funding, we have stabilised the chemical configuration for ultracapacitors, a process that would otherwise have taken 10-20 years. We have rapidly scaled-up production of VACNT by a factor of more than 1,000, from batches of a few square centimetres in a lab to hundreds of thousands of square meters a year.

We are now scaling up to mass production, with new equipment capable of producing millions of cells annually, ready to meet the rapidly growing demand while reducing the need for mining rare earth metals and increasing rehabilitation and recycling.

That is thanks to our patented and proprietary way of manufacturing VACNT in a single step roll-to-roll CVD process at unprecedented throughput rates and low cost. What’s more, NAWA can grow VACNT on a number of different substrates from aluminium to copper to carbon fibre composite structures.

Today’s global market for ultracapacitors is worth around €500m and estimated to grow to €2-3bn in 2023. This is complemented by applications in the €20bn capacitor market, as well as cathode and anode substitutes in lithium-ion cells – equivalent to 22% of the €42.3bn lithium-ion battery market. With NAWA’s first products expected to be delivered in 2020, we are ideally positioned to take advantage of increased demand for several key energy storage technologies.
NAWA has an extremely talented and committed team of employees with a diverse range of backgrounds, including extensive R&D and manufacturing experience.