Novel Carbon Nanotube Technology Creates More Powerful Ultracaps

NAWA Technologies has introduced a new type of ultracapacitor, NAWACap POWER, based on carbon nanotube electrodes. According to the company, this ultracap has energy densities that are comparable to other ultracaps (also known as supercaps), but a power density that is 10 to 100 times higher than the existing ultracaps. In other words, its internal resistance is 10 to 100 times lower than competing devices (see the figure).

To illustrate the impact of this low resistance, a 100-F NAWACap POWER ultracapacitor can have the internal resistance of a 3000-F market supercap. "This is important because in many applications requiring large short bursts of power, today one tends to oversize the supercap capacitance, in order to lower the internal resistance. Thus, ideal applications are where one has to deliver large current subsecond pulses, even milliseconds," says Mike Tommasi, consultant to NAWA Technologies.

Tommasi cites a few examples that can benefit from the new ultracaps. One is battery-operated IoT sensors or trackers. Here, the average current is low (a few milliamps) and is suitable for alkaline cells, but when the transmission occurs there are short current peaks of up to 2 A. Going up in power, cordless nail guns could use NAWACap POWER devices to deliver a pack of joules in a very short time without overloading the batteries.

And at still higher power levels, the new ultracaps could benefit the automobile power net or broad net. In this application more and more devices are being attached to the 12-V or 48-V power bus, and ultracaps could be used to smooth the enormous peak current demands of items like emergency braking.

The nanotubes are grown on aluminum foil. According to Tommasi, NAWA Technologies is the the first company to have developed a continuous, single-step process at atmospheric pressure for producing nanotubes, thus the product is high quality and economical.

"In our NAWACap POWER devices, we have the possibility of adjusting a new variable, the nanotube height. By doing this we can either lower resistance at the expense of higher volume, or vice versa, increase internal resistance and improve volume density. But in all cases, our internal resistance is far lower than normal supercaps. In other words, we can go from 10 to 100 times better than market supercaps in terms of internal resistance. This means that we can tune our nanotubes to the customer application," says Tommasi.

"For example, in IoT when we are dealing with millisecond pulses of about an amp, we can go for the lowest internal resistance. In these applications typically one uses low values of capacitance (1 to 10 F), but we can keep ESR around 1 mΩ or less. No other supercap on the market can do that, and up to now for these applications, engineers had to use more capacitance than needed (20 to 200 F), just to get a reasonably low resistance," he says.

In the case of a power net application, Tommasi cites an example involving 120-A pulses around one second long. "Here one can use 100-F capacitors with a "relaxed" resistance spec of about 0.5 mΩ. Of course, we are capable of going as low as 50 μΩ, but that would be resistance overkill. By using longer nanotubes we can reduce the volume and still have an internal resistance that is 16 times better than the lowest resistance supercapacitor on the market. In other words, during that 100-A pulse, the competitive 100-F supercap would drop 1 V due to internal resistance (that is almost half the supercap voltage), while the NAWACap POWER would drop 60 mV."

NAWACap POWER products are expected to be available in Q4 of this year with prices that are aligned with the market. For more information, see the website or email contact@nawatechnologies.com.

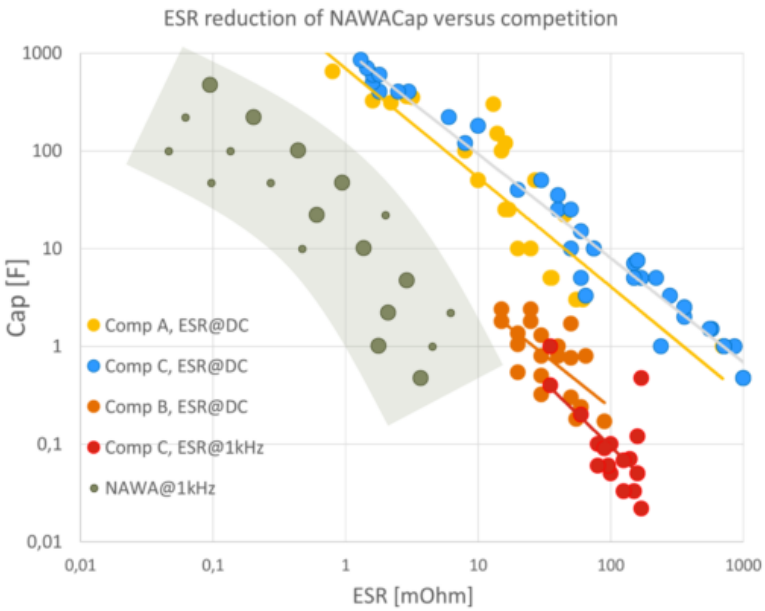

Figure. Thanks to their anisotropic structure and very high conductivity, NAWA's ultra-fast carbon electrodes enable a new generation of high-power supercapacitors (NAWACap Power) with equivalent series resistance (ESR) that is said to be more than 10 times lower than the competition and power densities said to be between 10 and 100 times higher than existing supercapacitors.