



31 HEMP SUPERCAPACITATORS TO POWER SUSTAINABLE FUTURE

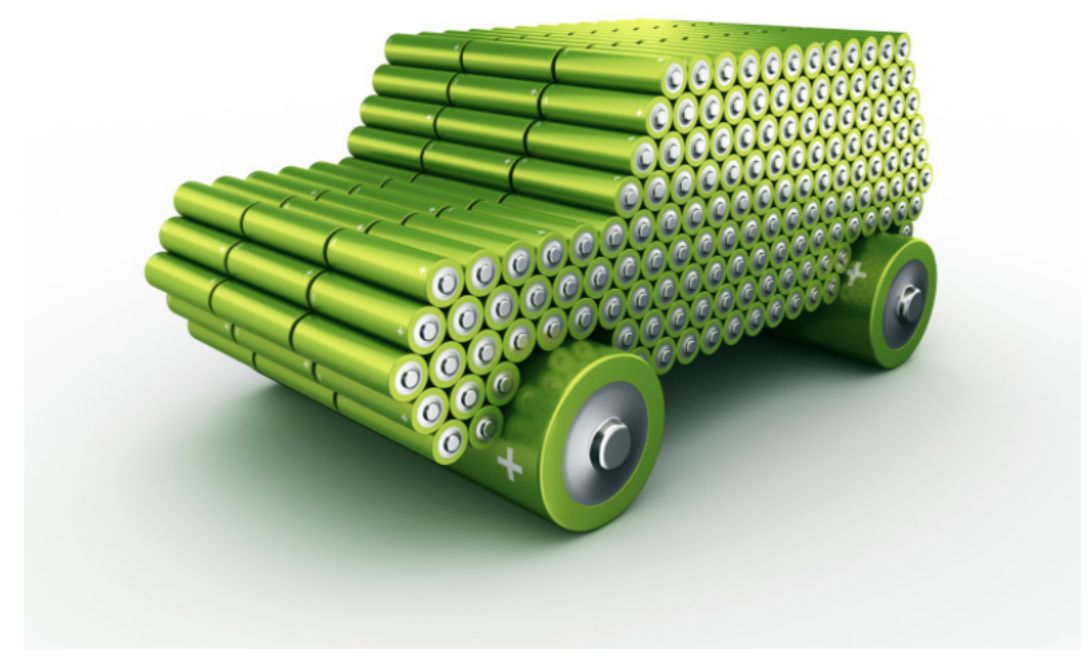
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The Future is Hemp

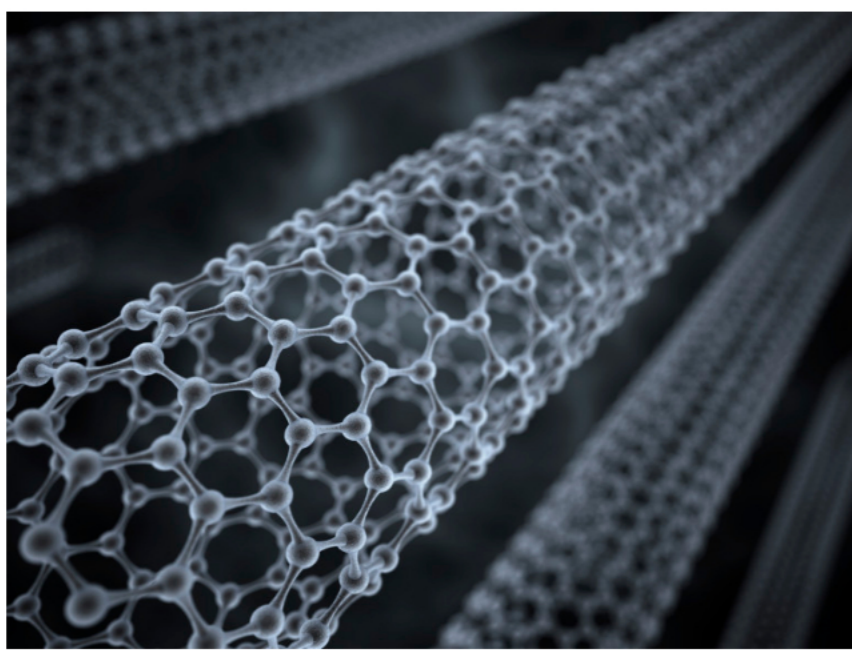
Any wise vision of an enlightened future must now include hemp. Hemp's remarkable uses are only increasing by the day. Not only is hemp a superior source of sustainable food, paper and bioplastic, it's also the key to how we can economically create and store our renewable energy. Biomolecular engineers recently discovered that you can use hemp bast, leftover fiber from hemp processing, as a marvelously effective electrode for supercapacitors.[1]

What's a Supercapacitor?

Supercapacitors are like batteries: they store and discharge electricity. However, batteries store energy electrochemically, while supercapacitors store energy electrostatically. Batteries contain chemicals that react to create an electric current. In contrast, supercapacitors retain static electricity on a conductive electrode to be released as needed, in the same way you can amass static electricity and deliver a shock with the touch of your fingertip. This fundamental difference lets supercapacitors charge and discharge electricity faster than a battery. Supercapacitors also endure many more cycles of recharging and safely function in more extreme temperatures. These capabilities make them crucial components for advancing technologies like electric cars. Imagine charging your car in seconds and never needing to replace its electrical storage devices!



Hemp Extends Sustainable Resources



Such incredible possibilities are now closer to reality, for hemp-derived electrodes will tremendously increase the availability of sustainable supercapacitors. The hemp alternative is one thousand times cheaper and infinitely more environmentally friendly to produce than graphene, the current industry standard for supercapacitors.[2] Graphene production requires mining graphite and using expensive and harmful chemicals.[3] In contrast, hemp farming actually enhances the soil and requires less resources than many other crops.[4] Various industries will process hemp to make sustainable products, and then supercapacitor makers will use the leftover hemp bast for electrodes, minimizing waste and maximizing utility.

Making Hemp-Based Energy Storage

Without employing costly, toxic substances, the team led by David Mitlin, PhD of Clarkson University uses a heating process to transform hemp bast into carbon nanosheets. They heat the material at 350 degrees Fahrenheit for a day and then apply a blast of extremely high temperatures.[5] Mitlin's team then uses these hemp-derived carbon nanosheets to power their supercapacitors, which significantly outperform current commercial models. The researchers found that "the hemp-based devices yielded energy densities [or the amount of energy a supercapacitor can store based on its volume] as high as 12 watt-hours per kilogram, two to three times higher than commercial counterparts. They also operate over an impressive temperature range, from freezing to more than 200 degrees Fahrenheit." [6] Truly, industrial hemp biomass would revolutionize the future of sustainable energy use and storage.

Hemp is Driving Sustainability

This year, commercial supercapacitors incorporating hemp-derived electrodes will finally be available. Professor Mitlin and his company, CQuest Partners, LLC will begin production this March at their newly established manufacturing facility in New York.[7] On a global scale, we can imagine diverse industries utilizing locally-grown hemp and selling the once discarded hemp bast to supercapacitor factories. Current laws against hemp cultivation hinder the development of hemp-based supercapacitors as well as innumerable sustainable technologies and environmental solutions. We need to correct the myopic vision that limits our future. As enlightened people, we can help promote hemp's tremendous potential, urging all states and governments to repeal the archaic prohibition of industrial hemp growing. Legalization progresses steadily, and with hemp-based supercapacitors accelerating innovation, a future powered by renewable energy will be one watt closer.



Notes

[1] "Hemp Nanosheets Could Be Better Than Graphene for Making the Ideal Supercapacitor," *Kurzweil*, June 16, 2015, http://www.kurzweilai.net/could-hemp-nanosheets-topple-graphene-for-making-the-ideal-supercapacitor_

[2] Erin Hiatt, "Cannabis-Based Batteries Could Change The Way We Store Energy," *reset.me*, February 25, 2015, <http://reset.me/story/cannabis-based-batteries-could-change-the-way-we-store-energy/>.

[3] Ibid.

[4] Lindsay Abrams, "Why America's Fired Up About Hemp," *Salon*, April 19, 2014, http://www.salon.com/2014/04/19/why_americas_fired_up_about_hemp/.

[5] Marco Torres, "Hemp-Based Batteries Could Change the Way We Store Energy Forever," *Global Research*, August 19, 2014, <http://www.globalresearch.ca/hemp-based-batteries-could-change-the-way-we-store-energy-forever/5396536>

[6] Ibid.

[7] Jimmy Lawton, "Potsdam Startup Company Wants to Turn Hemp Into Batteries," *North Country Now*, January 17, 2016, <http://northcountrynow.com/news/potsdam-startup-company-wants-turn-hemp-batteries-0161975>.