24002 Batteries of the future: How cotton and seawater might power our devices

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With huge demand for batteries expected in the coming years, propelled by the rise of electric vehicles and large energy storage systems, some researchers and businesses are frantically developing possible alternatives to the lithium ion and graphite batteries that are commonplace today. Like PJP Eye, a Japanese firm that makes batteries, they argue we could be using much more sustainable and widely available materials for battery production.

Lithium mining can have a considerable impact on the environment. Extracting the metal requires large amounts of water and energy, and the process can leave huge scars in the landscape. The recovered lithium is often shipped long distances from where it is mined to be refined in countries such as China. Graphite, too, is mined or made from fossil fuels, both of which also have negative environmental impacts. "It's very easy to imagine, as a battery material goes through mining and transportation, how that carbon footprint can really add up," says Sam Wilkinson, an analyst at S&P Global Commodity Insights.

To take another example: cobalt, which is used in many lithium-ion batteries, is predominantly extracted in the Democratic Republic of Congo. But there have been reports of dangerous working conditions there.

From seawater to biowaste and natural pigments, there is a long list of potential alternatives in nature that would be much more widely available – the hard part is proving that any of them can realistically compete with the kinds of batteries already on the market, which are seemingly so indispensable in our gadget-strewn world.

PJP Eye also promotes the possibility of improving battery performance as well as making batteries greener. "Our carbon has a bigger surface area than graphite," says Okina, the chief intelligence officer of the company, describing how the chemistry of the anode in their Cambrian single carbon battery allows for a battery that charges very quickly, up to 10 times faster than existing lithium ion batteries, he claims. The battery's cathode is made from a "base metal" oxide. Although Okina won't disclose exactly which one, these metals include copper, lead, nickel and zinc, which are less reactive than alkaline metals such as lithium. The company claims to be working on a dual carbon electrode battery, where both electrodes are made from plant-based carbon. The technology is based on research conducted by researchers at Kyushu University, although the battery is not expected to be available until 2025.

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