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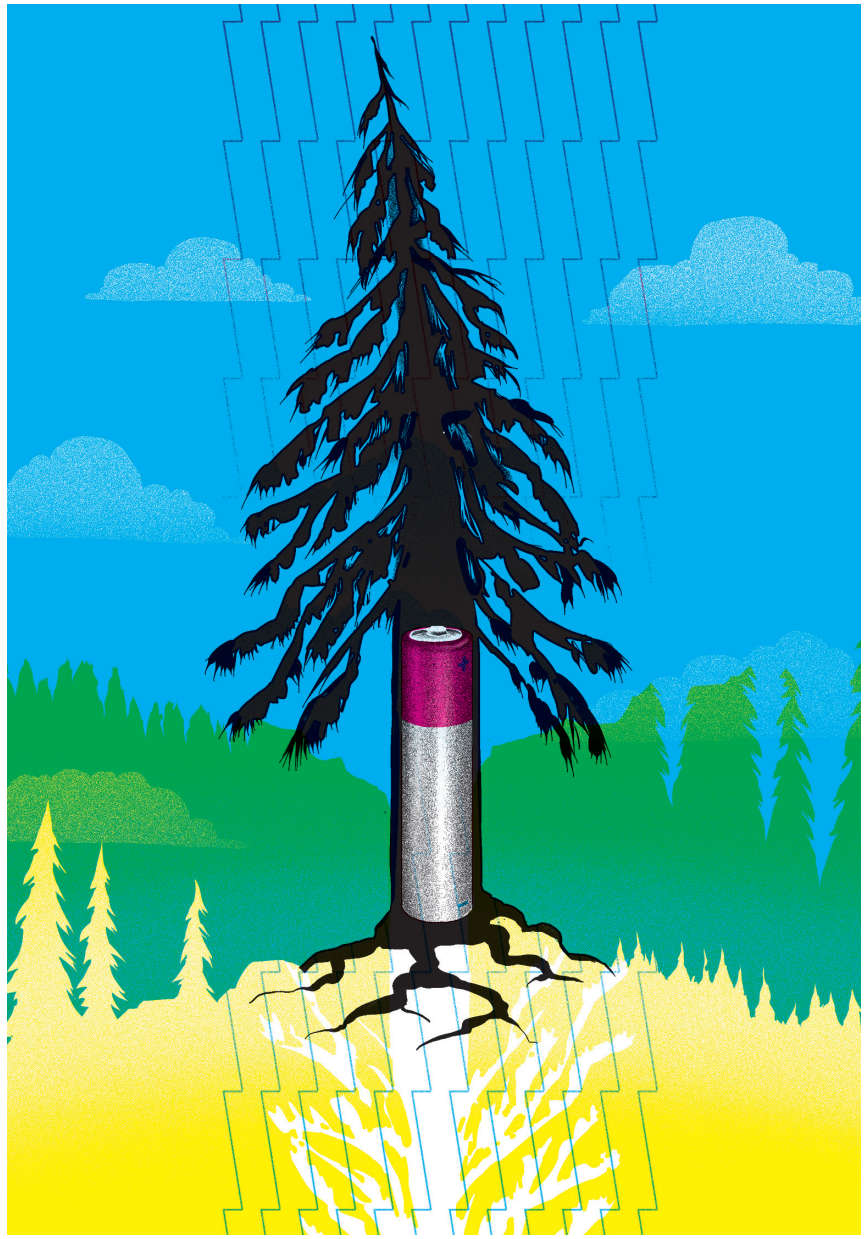
CARBON-BREATHING BATTERIES

Electrochemical cells could suck carbon out of the atmosphere and turn it into electricity



Cutting greenhouse gas emissions is not enough to stop global warming. At this point, we will have to remove some of the carbon dioxide already in the atmosphere. The good news is that there are plenty of ways to do this. The bad news: those methods generally require huge amounts of energy.

The ideal carbon-sequestering technology would generate electricity rather than burn it. In a study published in July in *Science Advances,* Wajdi Al Sadat and Lynden Archer, both researchers at Cornell University, described a design for an electrochemical cell that captures carbon dioxide.

The battery's anode is made of metallic aluminum, which is cheap, abundant, and easy to work with. The cathode consists of porous carbon, which the researchers inject with a mixture of gaseous oxygen and carbon dioxide. Aluminum, oxygen and carbon dioxide react inside the battery to yield electricity and aluminum oxalate. Sadat and Archer say that over the life span of the 1.4-volt battery, their cell sequesters a kilogram of carbon dioxide for every kilogram of aluminum used.

It also turns out that the chemical by-product where the carbon ends up—aluminum oxalate—is valuable. Global demand for oxalates, which are used as cleaning and bleaching agents, is around 230,000 metric tons a year, and every ton that comes from battery by-products is a ton that a carbon-belching factory does not have to produce. With all the carbon savings figured in, the batteries capture 3.52 kilograms of CO_2 for every kilogram of aluminum used to make them. "If you factor in the major sources of CO_2, these batteries come out ahead," Archer explains.

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Archer says that they are still far from turning their design into a usable technology. First, they need to demonstrate that the technology is cost-effective and scalable. If they can achieve that, Archer envisions the batteries someday outfitting a power plant or automotive tail pipes. "This way you're not just throwing away the CO_2," he says. "You're using it."

—Annie Sneed