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Small Device Currently on Mars Is Generating as Much Oxygen as a Tree, Scientists Reveal

The MOXIE experiment has proven that a lunchbox-sized device can reliably produce oxygen from the Martian atmosphere.

SW By Sarah Wells

August 31, 2022, 6:00pm

IMAGE: NASA

bring scientific experiments, emergency supplies, and living habitats.

Luckily for these pioneering astronauts though, it looks like one of the heaviest—and most important—resources will be provided on site: oxygen. In fact, a lunchbox-sized device currently on the surface of Mars is already reliably generating as much oxygen as a tree, scientists revealed on Wednesday.

Oxygen will be important not only to provide astronauts breathable air when they're off-planet but also to help fuel rockets to eventually take them back to Earth. In a new paper published on Wednesday in the journal *Science Advances*, researchers from MIT explain how a small experiment roaming Mars on the back of NASA's Perseverance rover is proof that it's possible to create oxygen from the Martian atmosphere.

This experiment is also the first to successfully harvest and use resources on any planetary body, a process that will be important not only for Martian exploration but future lunar habitats as well.

Michael Hecht is a co-author on the new paper and principal investigator of the project, called MOXIE (Mars Oxygen In Situ Resource Utilization Experiment). He told Motherboard in an email that researchers focused on harvesting oxygen because it would be one of the most difficult resources to bring from Earth and would have multiple roles to play in creating a sustainable habitat on Mars.

"I like to say rockets breathe a lot more than we do," Hecht said. "Just for the lift-off to orbit, the rocket will use more that 10 times the amount of fuel than the crew of 4-6 will use in their year-and-a-half stay on the surface, and hence it will need 10 times as much oxygen."

through a HEPA filter to remove any dust, heated to 800 degrees Celsius and compressed such that it breaks apart into just oxygen ions and CO. The oxygen ions are then isolated and recombined to create breathable and combustible O2.

So far, MOXIE has been able to create six grams of oxygen per hour in each of its seven runs, which researchers say is equivalent to a small tree. And while MOXIE does create a small amount of CO2 and CO exhaust from this process, Hercht says it's nothing that would harm the Martian atmosphere.

“There is already trace oxygen and CO on Mars from natural causes such as radiation breaking up CO2 molecules,” Hercht said. “In many ways it’s the ultimate clean fuel system, similar to hydrogen fuel on Earth.”

While MOXIE is proof positive that it’s possible to create oxygen on another planet, the system itself is not yet robust enough to sustain a habitat on Mars. To do that, Hecht said that researchers will need to scale MOXIE up to the size of a “small chest freezer.” At this scale, MOXIE 2.0 could create enough oxygen to either sustain 100 crew members on Mars or lift a four-person crew off-planet in a rocket.

Scaling up the technology itself shouldn’t be too challenging said Hercht, but running the system autonomously on Mars for thousands of hours could be trickier, especially since the original MOXIE has so far only run for less than 100 hours since it touched down last year.

In the meantime, Hecht and colleagues are eager to continue testing MOXIE both on Mars and in a Mars simulated lab back on Earth to push the technology’s boundaries. In particular, they’re looking forward to increasing production capacity

With a little moxie, and MOXIE-generated oxygen, the future of Martian habitats is looking better everyday.

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