

Scientists Make Oxygen Out of Moon Rock

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Scientists have developed a method to produce oxygen from moon rock. Image credit: NASA.

(PhysOrg.com) -- If humans ever create a lunar base, one of the biggest challenges will be figuring out how to breathe. Transporting oxygen to the moon is extremely expensive, so for the past several years NASA has been looking into other possibilities. One idea is extracting oxygen from moon rock.

Recently, Derek Fray, a materials chemist from the University of Cambridge, and his colleagues have built a reactor that uses oxides in Moon rocks as the cathode in an [electrochemical process](#) to produce oxygen.

The design is based on a process that the researchers invented in 2000 that produces carbon dioxide. In this design, the scientists pass a current

between the cathode and an anode made of carbon, with both electrodes sitting in an electrolyte solution of molten calcium chloride, a common salt. The current removes oxygen atoms from the cathode, which are then ionized and dissolve in the molten salt. The negatively charged oxygen is attracted to the carbon anode, where it erodes the anode and produces carbon dioxide.

To produce oxygen rather than [carbon dioxide](#), the researchers made an unreactive anode using a mixture of calcium titanate and calcium ruthenate instead of the carbon. Because this anode barely erodes, the reaction between the oxygen ions and anode produces oxygen.

Based on experiments with a simulated lunar rock developed by NASA, the researchers calculate that three one-meter-tall reactors could generate one tonne of oxygen per year on the Moon. Each tonne of oxygen would require three tonnes of rock to produce. Fray noted that three reactors would require about 4.5 kilowatts of power, which could be supplied by solar panels or possibly a small [nuclear reactor](#) on the Moon. The researchers are also working with the [European Space Agency](#) on developing an even larger reactor that could be operated remotely.

As a recent story in Nature News reports, other researchers are also developing methods for oxygen extraction. For instance, Donald Sadoway at MIT is working on a high-temperature technique called molten salt electrolysis. Here, the Moon rock is molten and acts as the electrolyte itself. Sadoway's reactor could even be built out of the rubble on the Moon's surface called regolith.

NASA and the ESA are strongly encouraging this type of research. In 2008, NASA boosted its \$250,000 prize to \$1 million for the first team to demonstrate a method to extract five kilograms of [oxygen](#) in eight hours from simulated Moon rock. So far, the prize remains unclaimed.

via: [Nature News](#)

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