Helium
A Gas Facing Extinction

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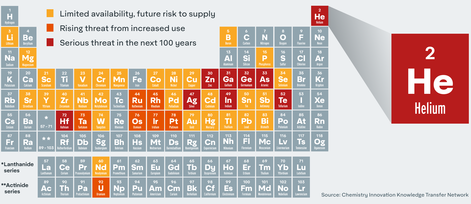
THE PERIODIC TABLE'S ENDANGERED ELEMENTS



Source: Chemistry Innovation Knowledge Transfer Network

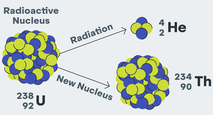
Helium

Helium is named after the Greek word for the sun, helios, as it was first identified in the sun's corona (the sun is composed of 25% helium).[1] The second most abundant element in the universe, helium is scarce on Earth. A product of nuclear fusion and radioactive decay, it is the lightest noble gas, colorless, odorless, and inert with a low boiling point.

As an irreplaceable element used in medical diagnostic equipment, a secure supply of helium relates to U.N. Sustainable Development Goal #3: Good Health & Well-Being.

Where is it from?

On the Earth, most helium is a radioactive decay product of uranium and thorium. It is found under the Earth's crust with other natural gases. Commercial helium is extracted from natural gas when the helium concentration is above 0.3%.[2]



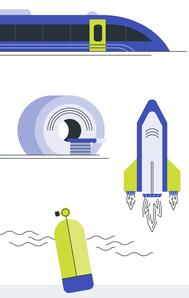
The U.S., Qatar and Algeria have the world's major helium reserves, while the U.S., Russia and Algeria are the top suppliers. In the U.S., helium is found primarily in the Texas panhandle and Kansas.[2]

The U.S. Helium Reserve, located deep underground Amarillo, Texas, is slated to be shut down by 2021; it has provided 30% of the world's supply for many years.[3] Uncertainty about how private markets will distribute and price helium is a concern, especially to scientific researchers using small amounts of helium.

A recent discovery of helium beneath Tanzania may provide a short-term boost in future helium supply if development challenges can be overcome.[4]

How is it used?

While the general public might be most familiar with helium's buoyancy—which makes it ideal for filling birthday balloons, Macy's Day Parade figures and blimps—helium has many other irreplaceable uses:



- Liquid helium is unique among all elements in that it can reach ultra-cold temperatures, approaching absolute zero (-273.15°C). Research conducted at these low temperatures has led to discoveries in superconductivity that have led to many applications, including the Maglev high-speed train.[2]
- Helium's cooling properties are indispensable to scientific research and medical diagnostic equipment including magnetic resonance imaging (MRI) machines, NMR spectrometers and even the Large Hadron Collider.[1,2]
- Helium is used to cool nuclear reactors and keeps rocket fuel cool during lift-off.[5]
- Due to its unreactive nature, helium provides a protective atmosphere for making fiber optics, semiconductors, and in arc welding.[1]
- Deep-sea divers breathe a mixture of helium and oxygen, which helps them avoid the dangers of "the bends."[2]

Why is it a critical element?

ATMOSPHERIC RECOVERY IS NEARLY IMPOSSIBLE

Liquid helium boils off and can be captured and recycled by re-liquefying it. In the U.S., only a small amount of recycling infrastructure is in place.[2]

Once helium is released in the atmosphere, it will continue rising until it escapes into space, making it the only truly unrecoverable element.

Helium in recoverable quantities is found in only a few locations around the world, and these sources are being rapidly depleted. Accordingly, the U.S. has important economic and national security interests in ensuring a reliable supply of helium.[5]

PRICE SHOCKS ARE FREQUENT

The cost of helium has increased 250% over the last five years, making scientific research more expensive.[2]

The helium market is subject to frequent price shocks. In 2017, the blockade of Qatar suddenly removed 30% of the world's helium supply from the market, causing prices to temporarily skyrocket.[4]

What can we do about it?

CHEMISTS

- Work to increase recycling infrastructure in laboratories; capture and reuse helium that is used for instrument cooling, or in cryopumps, etc.[2]
- Explore alternatives such as using hydrogen for buoyancy applications (where flammability is not objectionable).[6]
- Explore the use of hydrogen to replace helium as a carrier gas in gas chromatography.

INDIVIDUALS

- Opt not to buy helium balloons.

INSTITUTIONS

- Establish price controls and market stabilization measures for scientific research use.[2]
- Fund research labs to implement small-scale recycling technology and other methods of reducing helium usage.[2]

Find out more about Critical and Endangered Elements: **acs.org/endangered-elements**

SOURCES

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