La NASA halla un componente del plástico en Titán, una luna de Saturno

(Reuters) - La sonda espacial Cassini de la NASA halló propileno, un químico usado para fabricar plástico, en Titán, una de las lunas de Saturno, dijo la agencia espacial estadounidense.

"Este es el primer descubrimiento definitivo del componente del plástico en un satélite o planeta, más que en la Tierra", dijo la NASA.

Una pequeña cantidad de propileno fue hallado en la atmósfera baja de Titán por el espectrómetro infrarrojo, que mide la radiación de calor, informó la agencia en la edición del lunes de la revista Astrophysical Journal Letters.

Al aislar la misma señal en varios niveles dentro de la atmósfera baja, los científicos identificaron el registro termal del químico con un alto grado de seguridad, dijo la NASA.

"Este químico está en todos lados en nuestra vida diaria, unido en largas cadenas para formar un plástico llamado polipropileno", dijo Conor Nixon, un científico en el Centro de Vuelo Espacial Goddard de la NASA en Greenbelt, Maryland, y principal autor del documento.

"Ese recipiente de plástico en el supermercado con el código 5 de reciclaje en la parte de abajo, eso es polipropileno", agregó.

El químico también es usado para fabricar defensas de coches y otros productos plásticos.

El descubrimiento podría ayudar a los científicos a entender el "zoológico químico" que forma la brumosa atmósfera de Titán, dijo Scott Edgington, el segundo científico a cargo del proyecto de Cassini en el Laboratorio de Propulsión a Chorro de la NASA en Pasadena, California.

La misión Cassini-Huygens es un proyecto conjunto de la NASA, la Agencia Espacial Europea y la Agencia Espacial Italiana.
Cassini probe sees plastic ingredient on Titan moon

The Cassini probe has detected propene, or propylene, on Saturn's moon Titan. On Earth, this molecule, which comprises three carbon atoms and six hydrogen atoms, is a constituent of many plastics.

It is the first definitive detection of the plastic ingredient on any moon or planet, other than our home world, says the US space agency (Nasa). The discovery, made by Cassini's infrared spectrometer, is reported in Astrophysical Journal Letters.

"This chemical is all around us in everyday life, strung together in long chains to form a plastic called polypropylene," said Conor Nixon, a Nasa planetary scientist from the agency’s Goddard Space Flight Center. A classic example would be the plastic boxes used to store food in kitchens worldwide.

Titan is dominated by hydrocarbons - principally methane, which after nitrogen is the most common component of the atmosphere. Sunlight drives reactions that break apart the methane, allowing the fragments to join up and form even bigger molecules.

Other common species seen at the moon as a result are propane, which on Earth is used in portable cooking equipment, and ethane, which is the raw material for another ubiquitous plastic - polyethylene.

But the likes of methane, propene, propane and ethane are dwarfed by some truly colossal hydrocarbons that have been detected in Titan's atmosphere.

When the effects of ultraviolet light are combined with the bombardment from particles driven in Saturn's magnetic field, it becomes possible to cook up some very exotic chemistry.

Cassini’s plasma spectrometer has seen evidence for hydrocarbons with an atomic mass thousands of times heavier than a single hydrogen atom.
NASA’s Cassini Spacecraft Finds Ingredient of Household Plastic in Space

Cassini looks toward the night side of Saturn’s largest moon and sees sunlight scattering through the periphery of Titan's atmosphere and forming a ring of color.


PASADENA, Calif. – NASA's Cassini spacecraft has detected propylene, a chemical used to make food-storage containers, car bumpers and other consumer products, on Saturn's moon Titan.

This is the first definitive detection of the plastic ingredient on any moon or planet, other than Earth.

A small amount of propylene was identified in Titan's lower atmosphere by Cassini’s composite infrared spectrometer (CIRS). This instrument measures the infrared light, or heat radiation, emitted from Saturn and its moons in much the same way our hands feel the warmth of a fire.

Propylene is the first molecule to be discovered on Titan using CIRS. By isolating the same signal at various altitudes within the lower atmosphere, researchers identified the chemical with a high degree of confidence. Details are presented in a paper in the Sept. 30 edition of the Astrophysical Journal Letters.

"This chemical is all around us in everyday life, strung together in long chains to form a plastic called polypropylene," said Conor Nixon, a planetary scientist at NASA's Goddard Space Flight Center in Greenbelt, Md., and lead author of the paper. "That plastic container at the grocery store with the recycling code 5 on the bottom -- that's polypropylene."

CIRS can identify a particular gas glowing in the lower layers of the atmosphere from its unique thermal fingerprint. The challenge is to isolate this one signature from the signals of all other gases around it.

The detection of the chemical fills in a mysterious gap in Titan observations that dates back to NASA's Voyager 1 spacecraft and the first-ever close flyby of this moon in 1980.

Voyager identified many of the gases in Titan's hazy brownish atmosphere as hydrocarbons, the chemicals that primarily make up petroleum and other fossil fuels on Earth.

On Titan, hydrocarbons form after sunlight breaks apart methane, the second-most plentiful gas in that atmosphere. The newly freed fragments can link up to form chains with two, three or more carbons. The family of chemicals with two carbons includes the flammable gas ethane. Propane, a common fuel for portable stoves, belongs to the three-carbon family.

Previously, Voyager found propane, the heaviest member of the three-carbon family, and propyne, one of the lightest members. But the middle chemicals, one of which is propylene, were missing.

As researchers continued to discover more and more chemicals in Titan's atmosphere using ground- and space-based instruments, propylene was one that remained elusive. It was finally found as a result of more detailed analysis of the CIRS data.

"This measurement was very difficult to make because propylene's weak signature is crowded by related chemicals with much stronger signals," said Michael Flasar, Goddard scientist and principal investigator for
CIRS. "This success boosts our confidence that we will find still more chemicals long hidden in Titan's atmosphere."

Cassini's mass spectrometer, a device that looks at the composition of Titan's atmosphere, had hinted earlier that propylene might be present in the upper atmosphere. However, a positive identification had not been made.

"I am always excited when scientists discover a molecule that has never been observed before in an atmosphere," said Scott Edgington, Cassini's deputy project scientist at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "This new piece of the puzzle will provide an additional test of how well we understand the chemical zoo that makes up Titan's atmosphere."

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology, Pasadena, manages the mission for NASA's Science Mission Directorate in Washington. The CIRS team is based at Goddard.


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Detection of Propene in Titan's Stratosphere

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Abstract

The Voyager 1 flyby of Titan in 1980 gave a first glimpse of the chemical complexity of Titan's atmosphere, detecting many new molecules with the infrared interferometer spectrometer (IRIS). These included propane (C₃H₈) and propyne (CH₃C₂H), while the intermediate-sized C₃Hₓ hydrocarbon (C₃H₆) was curiously absent. Using spectra from the Composite Infrared Spectrometer on Cassini, we show the first positive detection of propene (C₃H₆) in Titan's stratosphere (5σ significance), finally filling the three-decade gap in the chemical sequence. We retrieve a vertical abundance profile from 100-250 km, that varies slowly with altitude from 2.0 ± 0.8 ppbv at 125 km, to 4.6 ± 1.5 ppbv at 200 km. The abundance of C₃H₆ is less than both C₃H₈ and CH₃C₂H, and we remark on an emerging paradigm in Titan's hydrocarbon abundances whereby alkanes > alkynes > alkenes within the C₂Hₓ and C₃Hₓ chemical families in the lower stratosphere. More generally, there appears to be much greater ubiquity and relative abundance of triple-bonded species than double-bonded, likely due to the greater resistance of triple bonds to photolysis and chemical attack.

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Titan, Saturn’s largest moon. Image Credit: NOAA/NASA/ESA
Saturn’s moon Titan is a bizarre world of methane lakes and choking atmosphere, and now it appears to be even stranger than we thought. NASA’s Cassini probe, in orbit of Saturn, has detected propylene on Titan. This compound is a key ingredient in run of the mill, Earth-bound plastic. This is the first discovery of a component of plastic anywhere apart from Earth.

The propylene was recognized by Cassini’s composite infrared spectrometer (CIRS), which measure the heat, in the form of infrared light, emanating from Saturn and its moons. CIRS is able to recognize gases in Titan’s lower atmosphere thanks to their unique thermal signatures, and NASA scientists must then parse out the signature of each gas from the surrounding gases.

“This measurement was very difficult to make because propylene’s weak signature is crowded by related chemicals with much stronger signals,” explained Michael Flasar, principal investigator for CIRS at NASA’s Goddard Space Flight Center, in a NASA press release. “This success boosts our confidence that we will find still more chemicals long hidden in Titan’s atmosphere.”

The detection of propylene by Cassini solves a mystery that has lingered around Titan since the first close flyby of the moon, conducted by the Voyager 1 spacecraft in 1980. Voyager’s observations revealed the presence of hydrocarbons in Titan’s atmosphere, which are created when sunlight breaks apart methane. Once shattered, the hydrocarbon fragments can join to form chains with two or more carbons. The two-carbon family includes ethane.

Voyager detected propane, the heaviest of the three-carbon group, and propyne, one of the lightest three-carbon molecules. However, the middle-weight three-carbon compounds, including propylene, were absent. Even as more data on Titan’s atmosphere were collected over the next three decades by other probes and ground-based telescopes, propylene remained undetected, until now.

“I am always excited when scientists discover a molecule that has never been observed before in an atmosphere,” said Scott Edgington, deputy project scientist for Cassini at NASA’s Jet Propulsion Laboratory. “This new piece of the puzzle will provide an additional test of how well we understand the chemical zoo that makes up Titan’s atmosphere.”