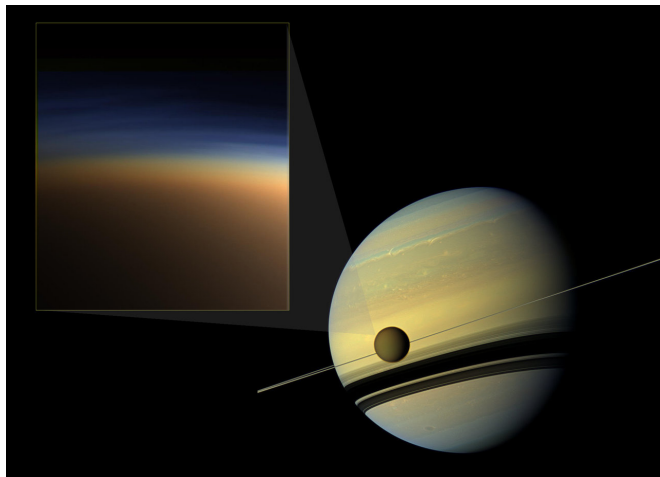


Saturn's largest moon may hold key to cleaner engines

8 October 2018, by Ayleen Barbel Fattal



The atmospheric haze of Titan, Saturn's largest moon (pictured here along Saturn's midsection), is captured in this natural-color image (box at left). Credit: NASA Jet Propulsion Laboratory, Space Science Institute, Caltech

A new discovery on Titan's haze is revealing new information about burning fuels on Earth.

Florida International University chemist Alexander Mebel and a team of international researchers have been studying Saturn's largest moon, trying to unlock a mystery brewing beneath Titan's thick, hazy atmosphere—How is it that dunes of hydrocarbons exist on the moon's frozen surface?

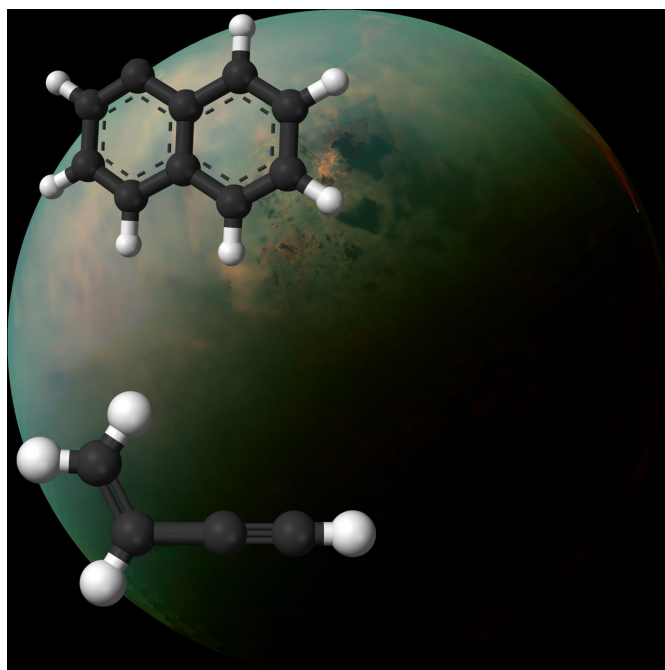
On Earth, the kinds of hydrocarbons that cause soot are only known to occur during the combustion process under very high temperatures. They are the kinds of byproducts that engineers usually try to eliminate when engines burn fuel.

By examining data from NASA's Cassini-Huygens probe, the researchers determined hydrocarbons can form the type of complex chains that create Titan's orange-brown haze layers at temperatures as low as 90 degrees Kelvin, which is about -298

degrees Fahrenheit—that's nearly 330 degrees below freezing on Earth.

According to the researchers, this provides evidence that a low-temperature [reaction](#) pathway not previously considered could provide a missing link in Titan's chemistry and yield clues to the development of complex chemistry on other moons and planets including Earth.

"Our calculations revealed the [reaction mechanism](#)," Mebel said. "We showed that you don't need any energy to drive the reaction of [naphthyl](#) and [vinylacetylene](#), so the reaction should be efficient even in the low-temperature and low-pressure atmospheric conditions on Titan."



Scientists have explored the chemistry at work when combining two gases: one composed of two-ring molecular structure known as naphthyl radicals (upper left), and the other composed of a hydrocarbon called vinylacetylene (lower left). The white spheres represent hydrogen atoms and the dark spheres represent carbon

atoms. Behind these 3-D molecular representations is an image of Saturn's moon Titan, taken by NASA's Cassini spacecraft. Credit: Wikimedia Commons, NASA Jet Propulsion Laboratory, Caltech, Space Science Institute, John Hopkins University Applied Physics Laboratory, University of Arizona

Provided by Florida International University

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