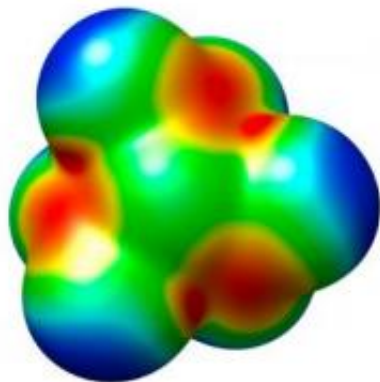


Discovery of new molecule can lead to more efficient rocket fuel

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Trinitramid -- that's the name of the new molecule that may be a component in future rocket fuel. Credit: KTH, the Royal Institute of Technology Sweden

Trinitramid - that's the name of the new molecule that may be a component in future rocket fuel. This fuel could be 20-30 percent more efficient in comparison with the best rocket fuels we have today. The discovery was made at the Royal Institute of Technology (KTH) in Sweden.

"A rule of thumb is that for every ten-percent increase in efficiency for [rocket fuel](#), the payload of the rocket can double. What's more, the molecule consists only of nitrogen and oxygen, which would make the rocket fuel environmentally friendly. This is more than can be said of today's solid rocket fuels, which entail the emission of the equivalent of 550 tons of concentrated hydrochloric acid for each launch of the space shuttle," says Tore Brinck, professor of physical chemistry at KTH.

Working with a research team at KTH, he discovered a new molecule in the nitrogen oxide group, which is not something that happens every day. It was while the scientists were studying the breakdown of another compound, using quantum chemistry computations, that they understood that the new molecule could be stable.

"As mentioned, what is specific to this molecule is that it contains only nitrogen and oxygen. Only eight such compounds were previously known, and most of them were discovered back in the 18th century. This is also clearly the largest of the [nitrogen](#) oxides. Its molecular formula is $N(NO_2)_3$, and the molecule is similar to a propeller in shape," says Tore Brinck.

The research team, consisting of Martin Rahm and Sergey Dvinskikh as well as Professor Istvan Furó, besides Tore Brinck, has now shown how the molecule can be produced and analyzed. The scientists have also managed to produce enough of the compound in a test tube for it to be detectable.

"It remains to be seen how stable the molecule is in a solid form," says Tore Brinck.

It was during work to find an alternative to today's solid rocket fuel that the researchers found the new molecule. The findings are now being published in the respected journal *Angewandte Chemie International Edition*.

More information: onlinelibrary.wiley.com/doi/10.1002/anie.201007047/abstract

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