

IIT Madras scientists create space fuel in lab

Simulating interstellar conditions in lab to help reduce greenhouse gases

Chennai: IIT Madras scientists have created what they call 'space fuel' by simulating interstellar conditions in the lab; a method that may be used to convert atmospheric CO₂ into a next-generation energy source on Earth.

The research, published in the journal *Proceedings of the National Academy of Sciences (PNAS)*, could help reduce greenhouse gases as well as provide a new, sustainable source of energy.

"What we have found is that molecules like methane and ammonia in space could exist in a completely different form than what is known to us," Thalappil Pradeep of Indian Institute of Technology (IIT) Madras told PTI.

Clathrate hydrates are molecules like methane, carbon dioxide, etc, trapped in well-defined cages of water molecules forming crystalline solids.

They are formed at high



File photo of Indian Institute of Technology, Madras

pressures and low temperatures at places such as the ocean floor, hundreds of metres below the sea level. They are also found in glaciers such as in Siberia.

Such hydrates especially that of methane, are thought to be the future sources of fuel. Many nations across the world including India have programmes to explore hydrates in the ocean bed.

IIT Madras researchers formed such hydrates in a vacuum, one thousand billion times below the atmospheric pressure called ultra-high vacuum (UHV) and temperature close to minus 263 degree Celsius. These are the conditions present in deep space.

This discovery of hydrates is highly unexpected at extremely low pressures and ultra-cold temperatures and

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may have several implications for the chemistry of such atmospheres, Pradeep said.

An experimental UHV was specially built for such studies, which housed several spectroscopic probes. Nanometre thin layers of ice and methane were prepared by condensing a mixture of the gases on a specially made single crystal of ruthenium metal.

—PTI