

Solid-State Material Releasing Dual Fuel Gases

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Why in News?

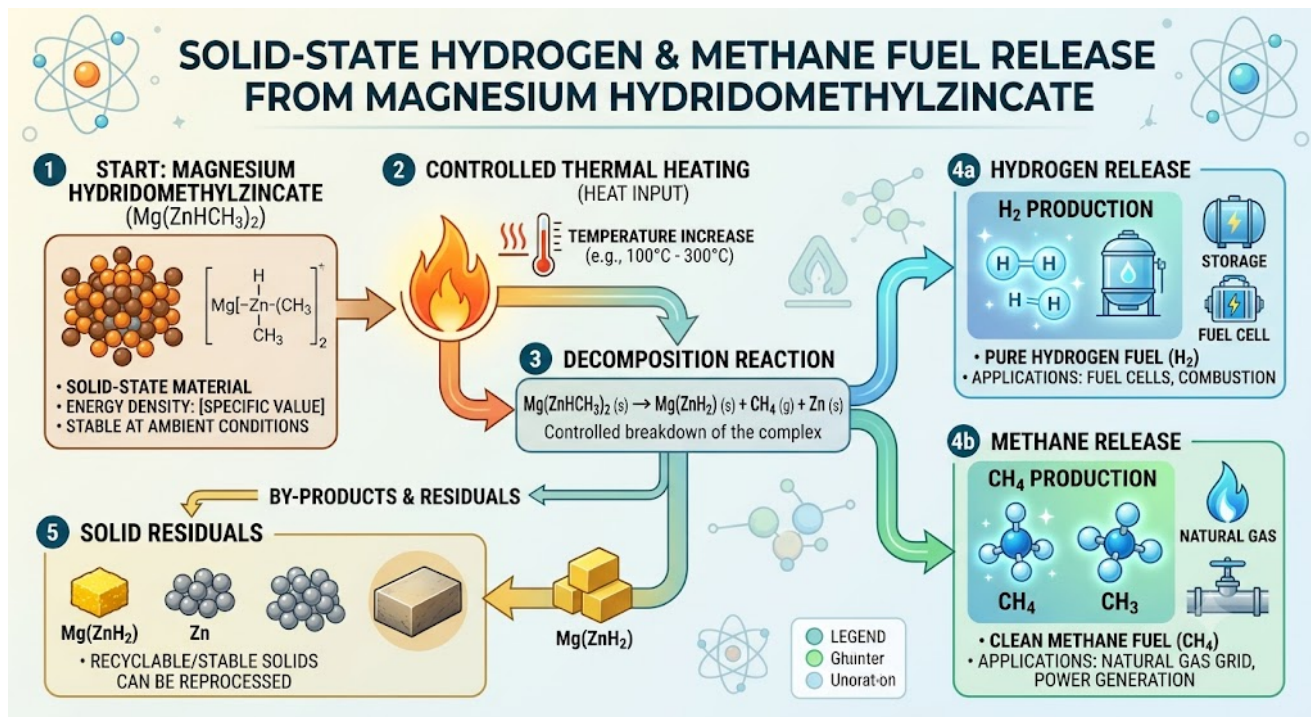
Recently, a major breakthrough in materials science and clean energy storage achieved by researchers at the Indian Institute of Science Education and Research (IISER).

Key Highlights

- The team successfully synthesized a novel solid-state complex material magnesium hydridomethylzincate capable of safely storing and subsequently releasing two clean fuel gases simultaneously (methane and hydrogen) under controlled thermal treatment.
- This offers a promising avenue for advanced hydrogen storage and dual-fuel generation technologies.
- **The Core Innovation**
 - Solid-state hydrogen and fuel storage is a critical bottleneck in clean energy research due to the safety hazards of pressurized gas cylinders and the low storage capacity of traditional metal hydrides.
 - Researchers engineered magnesium hydridomethylzincate, a bimetallic hydride-alkyl complex containing both metal-bound hydrogen (hydride) and methyl groups.
- **Dual-Gas Generation Mechanism**
 - Upon controlled heating, the solid material undergoes a thermal decomposition pathway that simultaneously releases **hydrogen (H₂)** and **methane (CH₄)** gases.
 - This dual-gas release can be fine-tuned, providing a high volumetric and gravimetric energy density storage medium.
- **Structural Stability** - Unlike volatile liquid fuels or highly unstable alkali metal hydrides, this bimetallic framework exhibits enhanced ambient stability, making it significantly safer for handling, transport, and controlled on-board generation.

Significance for Clean Energy

- Hydrogen is touted as the ultimate clean fuel for fuel cells, but safe, high-density storage remains a primary hurdle.
- Materials like magnesium hydridomethylzincate offer solid-state storage alternatives that circumvent high-pressure infrastructure requirements.
- The co-generation of hydrogen and methane provides a transitional fuel matrix which burns cleaner than conventional fossil fuels and can be utilized directly in existing internal combustion engines or specialized fuel cells.
- Highlights India's growing research capabilities in rational crystal engineering, bimetallic coordination polymers, and functional materials under national clean energy missions.



Reference

[The Hindu | Solid material that releases two fuel gases](#)