Jožef Stefan Institute, Ljubljana, Slovenia

TECHNOLOGY OFFER

RAPIDLY SCALABLE H_2 STORAGE AND PRODUCTION THROUGH AMMONIA AND HYDROGEN CONVERSION BY USING MAGNETIC HEATING

Fields of use
Hydrogen storage and production
Renewable energy integration
Engine fuel systems

Current state of technology
TRL4 (technology validated in the lab)

Next steps
Scale-up
Testing in an industrial environment

Type of cooperation
Technical cooperation agreement
Joint venture agreement
Licensing IP rights

Partners sought
Energy distributors
Chemical engineering companies
Catalyst's producers

Intellectual property
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Developed by
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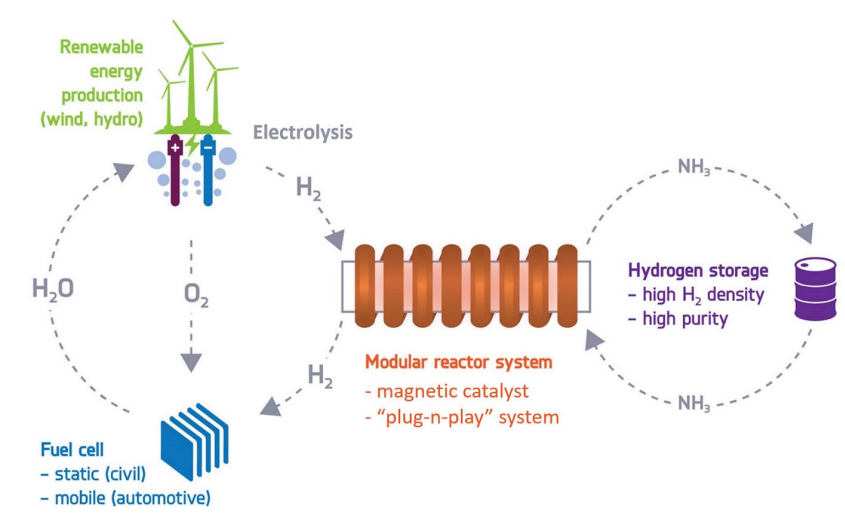
The increasing environmental impact of fossil fuels has shifted focus to renewable, carbon-free energy sources like hydrogen, especially in fuel cells. However, hydrogen's volatility and storage challenges call for stable and reversible storage methods. Ammonia (NH_3) is a promising candidate due to its high hydrogen content (17.8 wt. %) and low liquefaction pressure (8.6 bar at 20 °C). The traditional catalytic decomposition of ammonia is slow and energy-intensive, requiring external heating. This invention leverages magnetic (induction) heating for a quicker and efficient ammonia synthesis and decomposition.



Our technology
This invention presents a significant advancement in hydrogen gas storage and production technologies by utilizing structured, magnetically heated catalysts for efficient, rapid, on-demand, and reversible ammonia synthesis and decomposition. It includes catalyst materials, their preparation procedures, and a reactor system for gas-phase magnetic catalysis. The invention addresses hydrogen's volatility and storage challenges, facilitating the adoption of renewable energy sources and enhancing the efficiency of hydrogen-based applications. We look for R&D collaboration with the chemical and energy industry to further develop the technology in an industrial environment.

Main advantages
- Rapid temperature control: Magnetic heating allows for precise, rapid temperature adjustments, crucial for integration with renewable energy sources.
- Enhanced efficiency: The invention minimizes the heat transfer distance and temperature gradients, enhancing efficiency and reaction rates.
- On-demand production: Enables a flexible, on-demand hydrogen gas production for applications like fuel cells and internal combustion engines running on hydrogen-ammonia mixtures.