AKROS
ENERGY IN SALT

Hydrogen shipped like any other cargo.

A salt-based hydrogen carrier that bypasses high-pressure tanks, cryogenics and ammonia toxicity and moves through existing port and rail infrastructure.

$4.5 / kg H_2	75%	Zero	Non-toxic
TRANSPORTATION COSTS*	ROUND-TRIP EFFICIENCY	SELF-DISCHARGE	NON-FLAMMABLE ENVIRONMENTALLY HARMLESS

**The $4.50 / kg H_2 figure refers to the Oman → Rotterdam reference scenario from the cited Springer Nature study. AKROS deploys the crystallised form, with further economic upside.*

EXECUTIVE SUMMARY

The development of an international hydrogen economy depends on moving hydrogen at scale from regions of low-cost renewable production to industrial demand centres worldwide. Today's options; liquefied hydrogen, ammonia and LOHC; each carry significant trade-offs in safety, cost, infrastructure or efficiency.

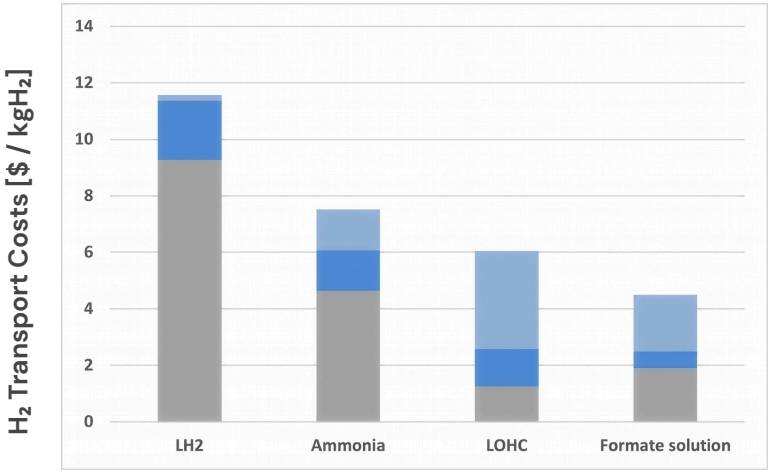
AKROS Energy offers a fundamentally different route. Hydrogen is bound chemically into a non-toxic salt (potassium formate) that is shipped in crystallised form through conventional bulk-carrier ships or dry-bulk train wagons and released on demand at the destination. The technology has the lowest energy consumption, the lowest delivered cost and the highest safety profile of any chemical hydrogen carrier.

Key facts

Carrier (loaded)	**Potassium formate**
Carrier (unloaded)	**Potassium bicarbonate**
Form for transport	**Crystallised solid**
H_2 content	**24 kg / t & 46 kg / m³**
Energy for storage	**~8 kWh / kg H_2**
Process conditions	**60 °C @ 0 – 30 bar**
Round-trip efficiency	**75%**
Hazard class	**Non-toxic, non-flammable**
Plant capacity (FOAK)	**100 kg H_2 / h**
First commercial plant	**2027**

Delivered cost: a step change.

Total delivered cost ($ / kg H_2), Oman → Rotterdam. Source: Springer Nature, "Green H_2 Transport through LH_2, NH_3 and LOHC: Opportunities and Challenges" (2024). The salt-based route is the lowest-cost option across all three cost components — conversion, shipping and dehydrogenation.



The transport challenge.

Renewable hydrogen will be produced where solar and wind resources are abundant — and consumed thousands of kilometres away, in the industrial centres of Europe, Japan, Korea and beyond. Moving hydrogen across those distances economically and safely is the precondition for a global hydrogen market.

Current options each fall short:

- Liquid H_2 — cryogenic (-260 °C), high boil-off losses, specialised vessels and terminals required
- Ammonia — toxic, highly regulated, costly cracking required at destination
- LOHC — high dehydrogenation energy demand at destination, hazard label

The AKROS solution.

Hydrogen is bound at the production site through catalytic hydrogenation of potassium bicarbonate ($KHCO_3$) into potassium formate (KCOOH). The loaded carrier is dewatered into a crystallised solid and shipped through conventional bulk infrastructure: bulk-carrier ships for ocean routes and dry-bulk rail wagons for inland delivery beyond pipeline networks.

At the destination, the reaction is reversed in a containerized or skid-mounted reconversion plant to release hydrogen on demand. The unloaded salt is returned for re-use, closing the loop. Loading and discharge use standard dry-bulk handling — no specialised port terminals required.

Where the technology applies.

MENA → Europe

Long-haul shipping of green hydrogen from solar-rich North Africa and the Gulf into European industrial demand centres via established bulk-cargo ports.

Australia → Japan / Korea

Trans-Pacific export corridors leveraging Australia's renewable hydrogen build-out, delivered into Japanese and Korean industrial off-takers.

Inland rail

Rail distribution to industrial sites, refineries and energy parks beyond existing or planned hydrogen pipeline networks.

CARRIER COMPARISON		Formate	Liquid H_2	Ammonia	LOHC (DBT)
Energy consumption for storage (kWh / kg H_2)		**~8**	~13	~17	~16
Process parameters		**60 °C 0 – 30 bar**	- 260 °C	400 – 500 °C 100 – 300 bar	300 °C 0 – 50 bar
H_2 Content	kg H_2 / t	**24**	1,000	176	62
	kg H_2 / m^3	**46**	71	121	54
Shipping Costs ($ / kg H_2)		**0.6**	2.1	1.4	1.3

Sources: Politecnico di Milano (2024), Roland Berger (2021). AKROS technology delivers the lowest energy consumption, lowest delivered cost, mildest process conditions and highest safety profile among the four leading chemical hydrogen carriers.

Technology maturity & deployment roadmap

TRL 6 → 7
Industrial pilot plant inaugurated May 2026 in Laage, Germany

Industry partners
Evonik and Siemens, long-term partners for technology scale-up

First commercial plant
Targeted for 2027 at 100 kg H_2 / h capacity (FOAK)

Generation 1
3 t H_2 / h nameplate capacity per plant

About AKROS Energy. AKROS Energy GmbH develops safe, efficient and cost-effective hydrogen storage and transport solutions based on salt as a low-cost carrier medium. The technology supports the reliable integration of renewable energy into industrial and energy systems. AKROS is a wholly owned subsidiary of H2APEX, headquartered in Rostock-Laage, Germany.

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