

FUTURE
ENERGY
EXPORTS

Cooperative Research Centre



Hydrogen Ortho-Para conversion in LH2 cycle through Baker Hughes novel compact equipment

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Staff scientist
BH Innovation

FEnEx CRC Annual Conference
1st and 2nd of May 2025-
Melbourne



We are Baker Hughes

May 8, 2025

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Why Baker Hughes

Where there's demand, we deliver.



Our ability to deliver energy tech leadership, integrated solutions, and customer focus is unmatched. By combining our unique strengths, we're making cleaner, more reliable, and more efficient energy a reality.

People & culture

We are a people-first company, driven by a relentless pursuit to serve our communities, and working together to achieve our shared vision.



Advanced technology

Our highly engineered, connected technologies are what the world relies on to meet energy demand now, while redefining what's possible in the future.



Low carbon & sustainability

As the leaders in energy technology, we are setting the pace, delivering a sustainable energy transition and cleaner energy future, faster.



Solutions & scale

We're the only energy tech company with the portfolio, scale, and reach to develop reliable, cleaner energy solutions for today and tomorrow.



2023 highlights

PERFORMANCE

\$30.5B

in orders

26%

increase in adjusted EBITDA*

\$2.0B

in free cash flow*

TECHNOLOGY AND INNOVATION

\$658M

in research and development

>2,000

patents granted

\$750M

in new energy orders

ESG LEADERSHIP

AA

ESG rating by MSCI

28%

reduction in Scope 1 & 2 GHG emissions**

199

HSE perfect days

ABOUT BAKER HUGHES

~58,000

employees

\$25.5B

in revenue

120+

countries where we conduct business

Leading Energy Technology company

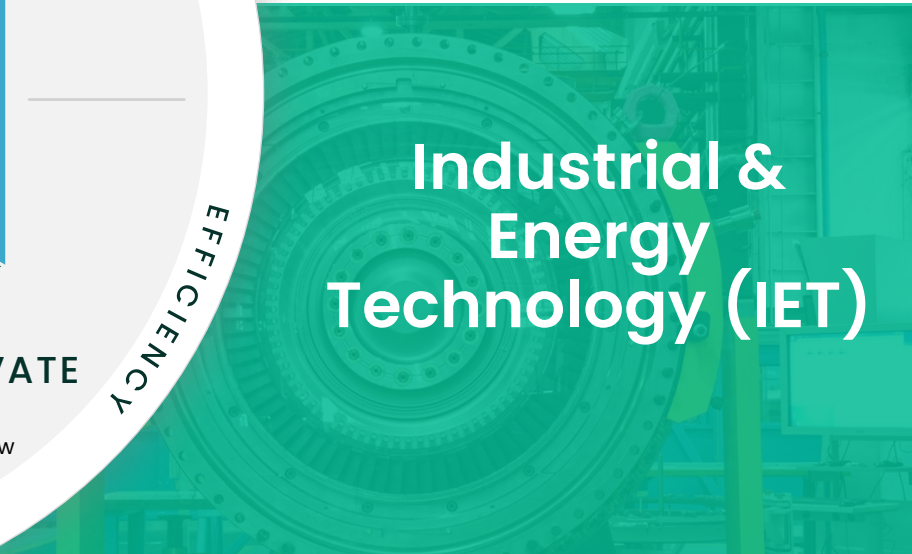
Baker Hughes has a diverse portfolio of technologies & services across the energy landscape



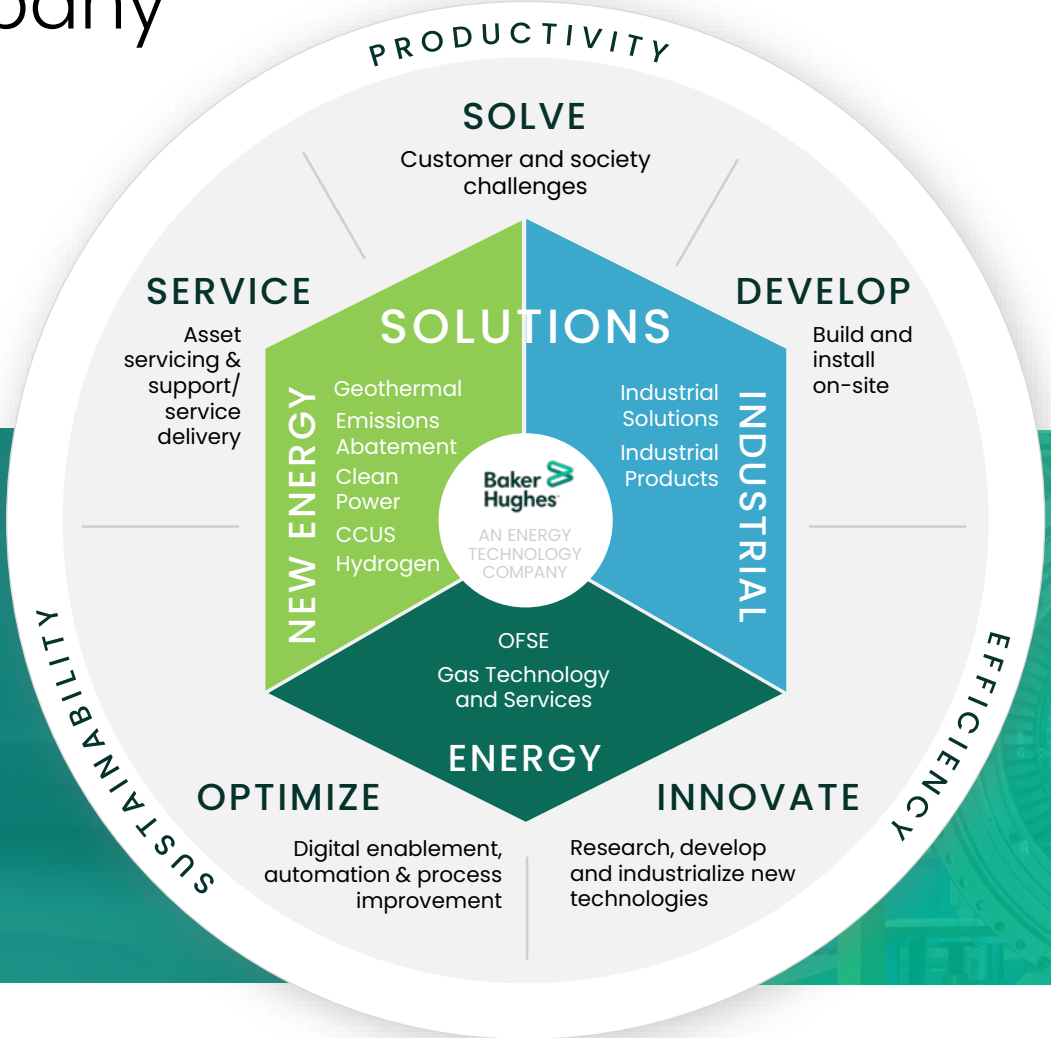
Providing equipment & solutions to help solve the world's greatest energy challenges



Oilfield Services & Equipment (OFSE)

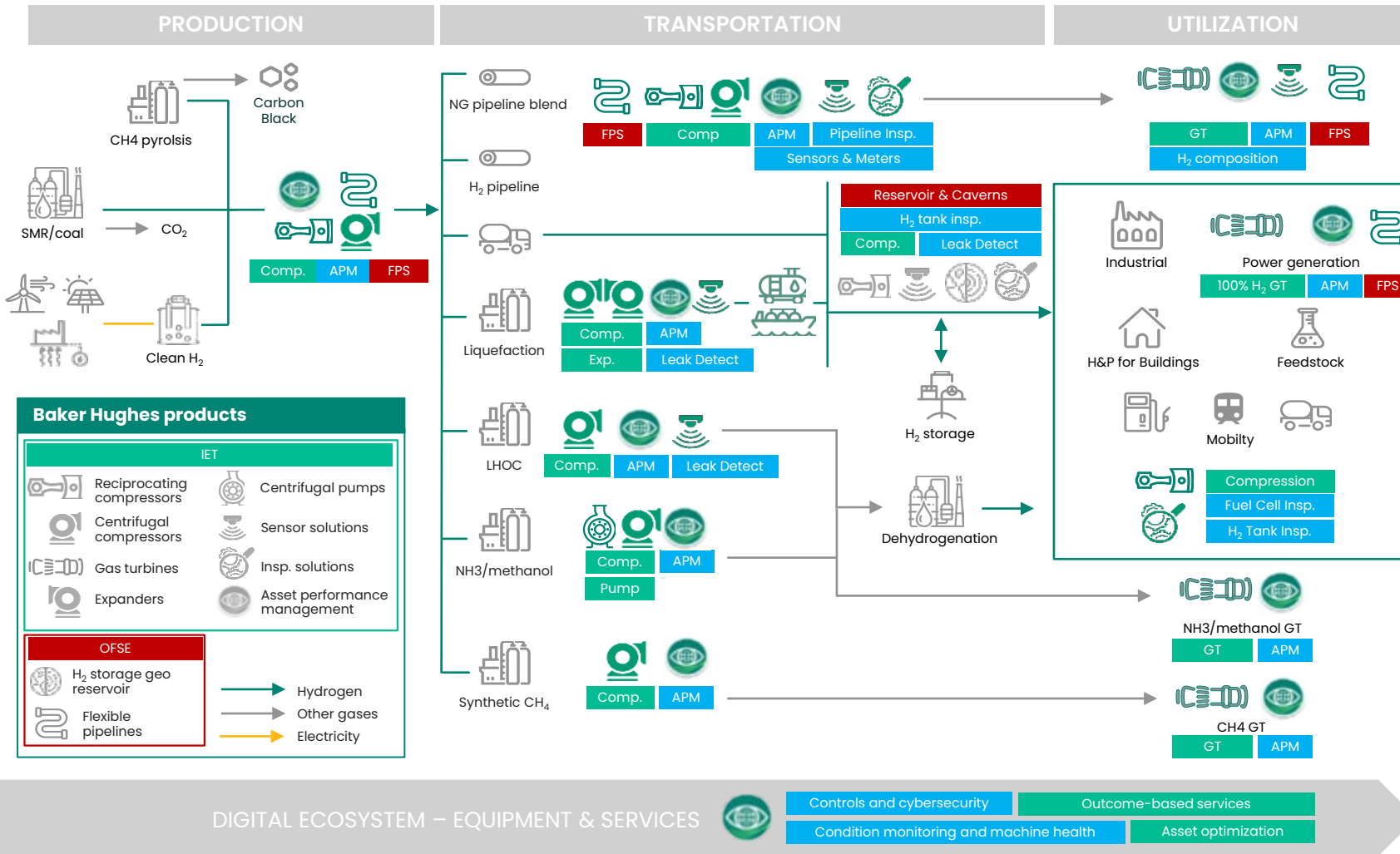


Industrial & Energy Technology (IET)



Hydrogen strategy

Our Portfolio across the H₂ Value Chain



~150 years of experience
working with hydrogen

Critical applications across
production, transportation,
and storage

Ability to work with
intermittent energy sources
to provide grid support

Digital portfolio of solutions
across the whole H₂ value
chain

We take energy forward



We are Baker Hughes, an energy technology company.

Together, we're making energy safer, cleaner, and more efficient for people and the planet.

Energy for today and tomorrow.

The energy sector is changing, faster than ever before. The energy trilemma – solving for energy security, sustainability, and affordability – is rebalancing our priorities and creating a new path forward for the industry.

We believe we can meet those objectives together. As demand for energy increases, we're demanding more from energy, making it more sustainable, more reliable, more abundant, and more accessible.

Electrolysis



Solid Oxide technology
March 2024



Early-stage hydrogen technologies
Dec 2021

Methane pyrolysis



Methane pyrolysis technology
to produce turquoise H2
Nov 2021

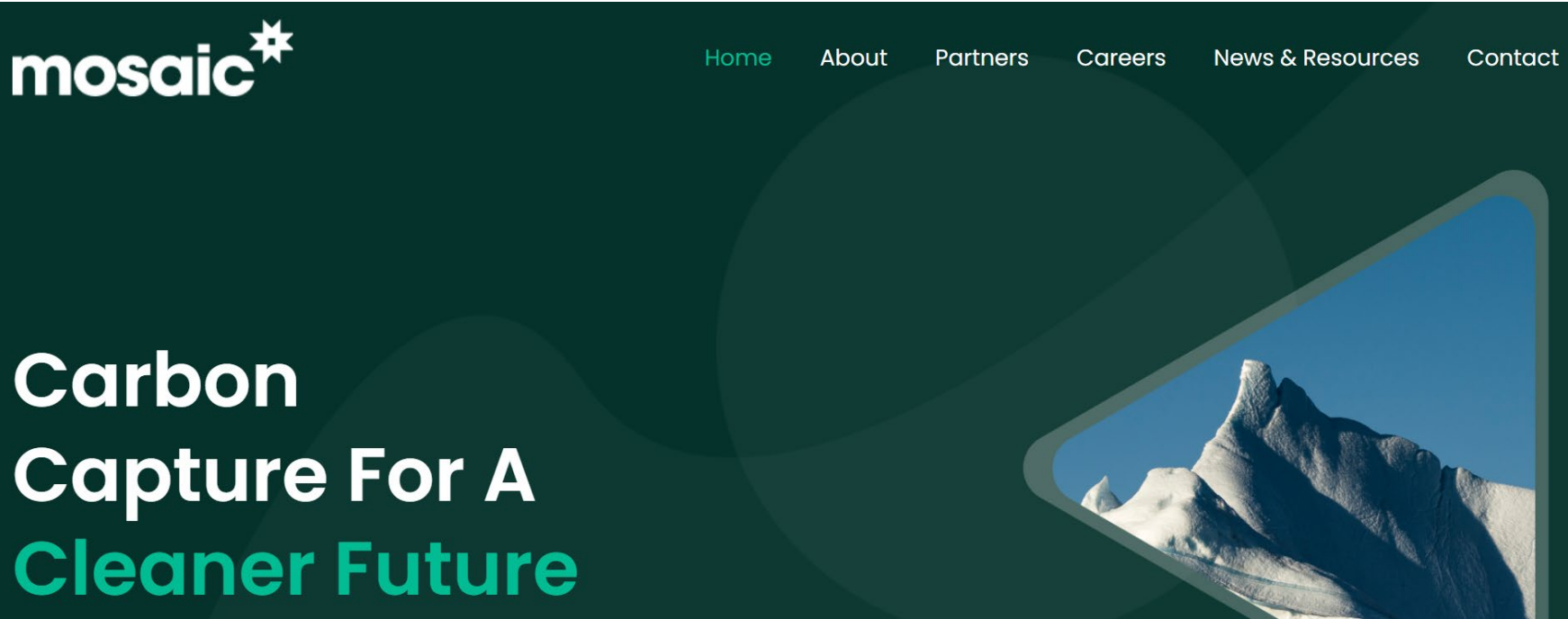


Low-pressure, low-temperature, high-value
graphene production system
Nov 2022

Strategic collaborations



BH acquisition for adsorber and catalyst materials




March 7, 2023

Baker Hughes and HIF Global to Collaborate on Direct Air Capture Technology

Agreement enables pilot testing to more quickly scale-up deployment of Direct Air Capture solutions HOUSTON, March 07, 2023...

September 2, 2023

Project Selections for FOA 2735: Regional Direct Air Capture Hubs – Topic Area 1 (Feasibility) and Topic...

Office of Fossil Energy and Carbon Management Project Selections for FOA 2735: Regional Direct Air Capture Hubs – Topic Area 1 (Feasibility) and Topic Area 2 (Technology) 

Patent licenses from Berkely include a variety of Metal Organic Framework useful for H2 treatment: adsorption and catalyst, namely Ni-MOF-74

Bringing state of the art Hydrogen technologies to market: The role of strategic collaborations

H₂/NG pipeline — Italy



Baker Hughes and SNAM successfully completed testing of the **world's first hybrid hydrogen turbine** designed for a gas network.

Green H₂—NEOM, KSA



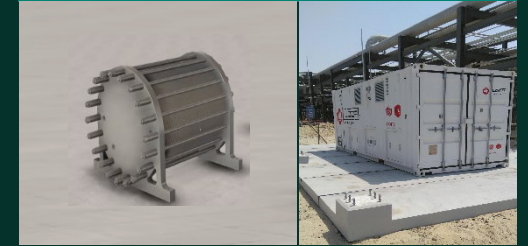
Providing **advanced hydrogen compression** technology to Air Products

Blue H₂ — Canada



Providing **100% hydrogen fueled NovaLT™16** gas turbine technology to Air Products

Low Carbon H₂ - UAE



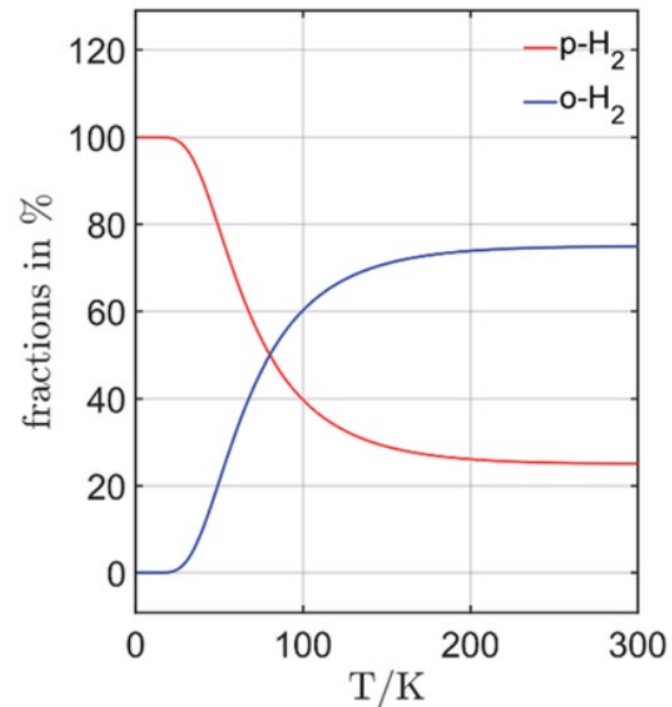
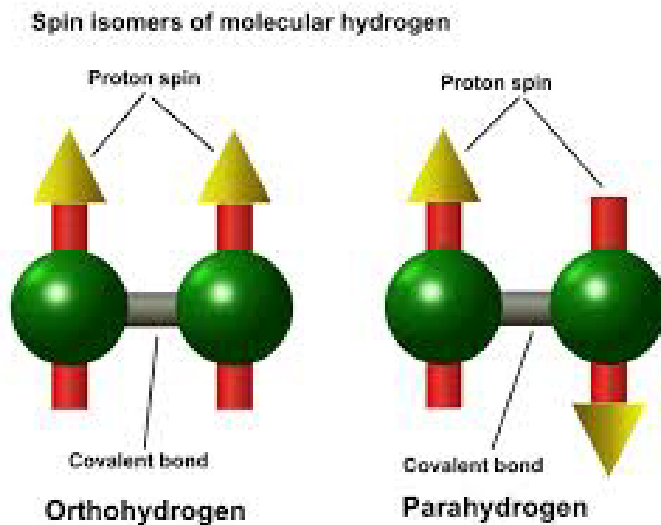
Collaborations with ADNOC to accelerate the development of **technology** solutions for **electrolysis and methane conversion into hydrogen and graphene**.

Partnering with world hydrogen industry leaders to lower production costs and accelerate adoption of hydrogen as a zero-carbon fuel

Hydrogen: BH and FEnEx CRC research activities

Hydrogen liquefaction

- LH2 using MCE with Holmium (S. Al Ghafri presentation)
- Ortho – para conversion with MOF catalyst
- ARENA project: “Development and demonstration of safe, efficient hydrogen liquefaction through optimized mixed refrigerants and plant design”



Hydrogen testing in ortho para conversion properties of novel BH – Mosaic MOF catalyst

Home > Results > WO2025045390A1

1. >

☆ **WO2025045390A1** AN OPTIMIZED SYSTEM TO REALIZE ORTHO TO PARA HYDROGEN CONVERSION WITH MOF CATALYST

Bibliographic data Description Claims Drawings Original document Citations Legal events Patent family

Register ↗ ⓘ Global Dossier ↗

Applicants NUOVO PIGNONE TECNOLOGIE SRL [IT] +

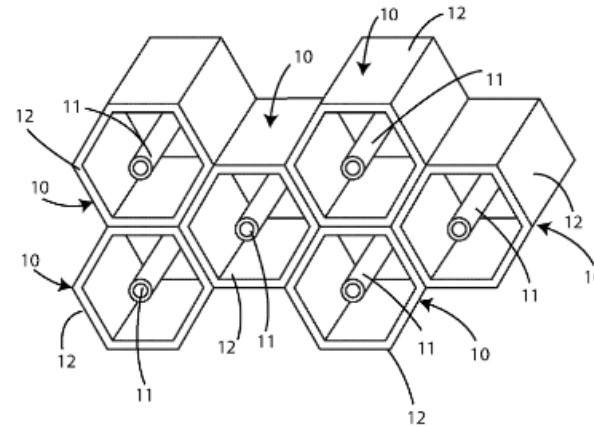
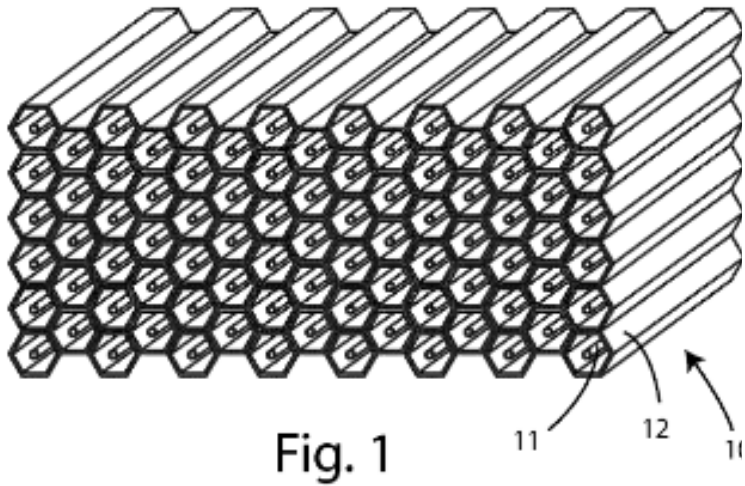
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Classifications

IPC **B01J19/24; C01B3/00; F17C11/00; F25J1/00;**

Hydrogen testing in ortho para conversion properties of novel BH – Mosaic MOF catalyst

HE with MOF which has been proven to have good o-p conversion properties
Our studies on MOF properties going on with Berkeley University



Thanks