HYDROGEN RESEARCH

RMIT UNIVERSITY Enabling Impact Platforms

Why Hydrogen Research at RMIT?

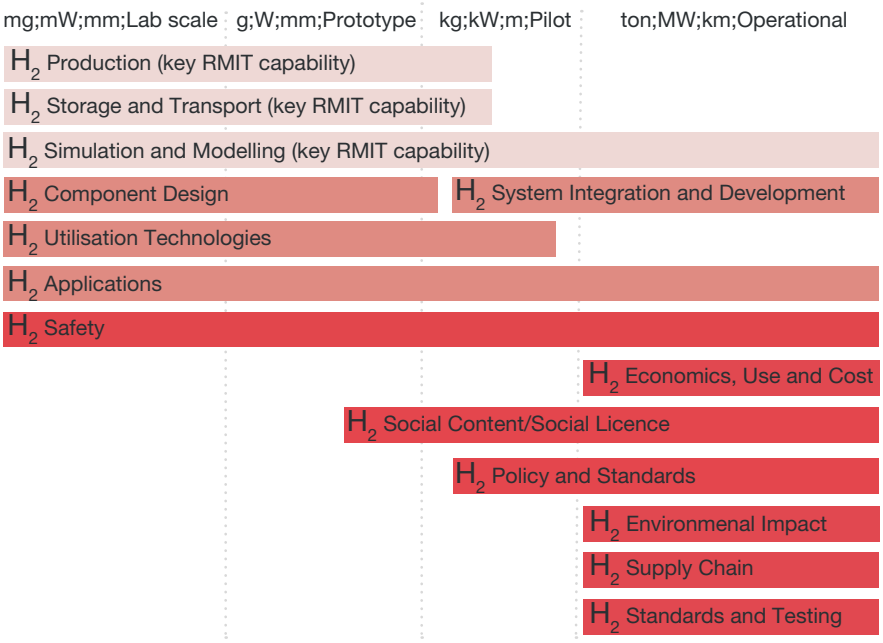
The rapid transition to net-zero emissions highlights the clear multidisciplinary opportunity for continued innovation in hydrogen research, and hydrogen is clearly articulated as an energy carrier in Australia's national priorities.

Capabilities

RMIT has significant and synergistic research capability that can be integrated to realise the delivery of complex innovation in the Hydrogen domain. It is well placed to support the transition of energy technologies to be scaled-up and translated. Our multidisciplinary capability from science and engineering to design, social sciences, business and law stretches across the Hydrogen value chain, with core expertise ranging from new fuel cells and electrolysers, to how societies accept and take-up and de-risk new technologies. RMIT works across scales to ensure that research activities are relevant to partners (Figure 1).

RMIT has decades of experience and know-how in Hydrogen innovation. We have a robust patent portfolio in the Hydrogen domain as well as important ancillary domains such as advanced materials, batteries and electrification. RMIT works with partners across the Hydrogen value chain including partners in the energy and environment, manufacturing, transport and logistics sectors.

Figure 1. Hydrogen@RMIT Capability across



RMIT's Enabling Impact Platforms are the University's unique mechanism to assemble researchers and industry experts to rapidly respond to large-scale, complex issues in society.

Supporting facilities

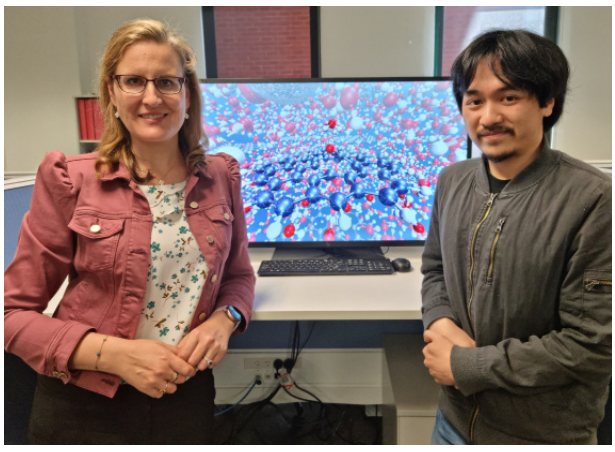
RMIT University excels in Additive Manufacturing, Advanced Materials, Industrial Automation, and Sustainability, with multidisciplinary delivery experience across Defence, Space, Transport, Medical and Energy sectors. As an example, the Advanced Manufacturing Precinct at RMIT's City Campus has the Digital Manufacturing Facility, Micro-Nano Research Facility and Microscopy and Microanalysis Facility, offering manufacturing and characterisation at nanometre to metre length scales and digital automation tech, which support industry partnerships.

RMIT's Sustainable Hydrogen Energy Laboratory (SHEL) research group pioneers research and development on hydrogen energy solutions in Australia and internationally. The group has invested in a significant $3.3 million defence project focussed on a Unitised Regenerative Fuel Cell (URFC) system.

Training

Hydrogen and Hydrogen Technologies will require new skills and create new jobs. RMIT University has identified that there will be a lack of expertise in Australia in many of the core domains relating to Hydrogen production, as with many emerging technologies. For example, we offer Masters of Sustainable Energy Engineering courses in "Electrical Energy Storage Systems" and "Renewable and Solar Fuels".

Molecular dynamics model of hydrogen storage with Prof Michelle Spencer and Kevin Tran, PhD student



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Enabling Impact Platforms

HYDROGEN COMMUNITY

STEM College
College of Business & Law & College of Design & Social Context
College of Design & Social Context & STEM College
College of Design and Social Context
College of Business & Law & STEM College

Component design
(catalyst, membane, GDL, bipolar plate, thermal management, gas/water flow channels, electronics and control)

Andrew Christofferson
Bahman Shabani
Brendan McGrath
Farid Christo
Hamid Arandiyan
James Tardio
Jianzhen Ou
Kalpit Shah
Ken Chiang
Michelle Spencer
Naba Dutta
Namita Choudhury
Nasir Mahmood
Nastaran Meftahi
Rachel Caruso
Rajarathinam Parthasarathy
Samuel Ippolito
Tianyi Ma
Torben Daeneke
Yasuhiro Tachibana
Ylias Sabri

Hydrogen storage and transportation
(high pressure, material based, synthentic fuels, ammonia)

Amgad Rezk
Bahman Shabani
Gary Rosengarten
Hamid Arandiyan
John Andrews
Kalpit Shah
Nasir Mahmood
Ken Chiang
Lathe Jones
Michelle Spencer
Rajarathinam Parthasarathy
Tianyi Ma
Torben Daeneke

Hydrogen production
(electrochemical, photochemical, reforming, nuclear)

Amgad Rezk
Bahman Shabani
Baohua Jia
Hamid Arandiyan
John Andrews
Kalpit Shah
Ken Chiang
Leslie Yeo
Michelle Spencer
Nasir Mahmood
Nicky Eshtiaghi
Rachel Caruso
Ravichandar Babarao
Suresh Bhargava
Tianyi Ma
Torben Daeneke
Xavier Mulet
Yasuhiro Tachibana
Ylias Sabri

System integration and development for various applications
(renewable hydrogen, microgrids, auxiliary power units)

Ahmad Mojiri
Arash Vahidnia
Bahman Shabani
Brendan McGrath
Carlos Teixeira
Farid Christo
Hamid Arandiyan
Inam Nutkani
Kazi Hasan
Lasantha Meegahapola
Manoj Datta
Nasir Mahmood
Pier Marzocca
Richardt Wilkinson

Hydrogen systems testing and assessment

Bahman Shabani
Petros Lappas
Ken Chiang

Hydrogen utilisation technologies
(fuel cell, combustion, internal combustion engines)

Bahman Shabani
Farid Christo
Gary Rosengarten
Hamid Arandiyan
Kalpit Shah
Ken Chiang
Nasir Mahmood
Petros Lappas
Pier Marzocca
Tianyi Ma
Torben Daeneke

Simulation and modeling (CFD, molecular dynamics, HOMER, TRYNSYS)

Bahman Shabani
Gary Rosengarten
Haoxin Mai
Kalpit Shah
Mahdi Jalili
Manoj Datta
Michelle Spencer
Milan Patel
Ravichandar Babarao
Sherman Cheung
Tu Le

Hydrogen applications
(stationary, transportation e.g., road vehicles, aviation, rail; portable power supply and other industrial applications)

Ahmad Mojiri
Bahman Shabani
Hamid Arandiyan
Ken Chiang
Nasir Mahmood
Petros Lappas
Pier Marzocca
Ravichandar Babarao

Hydrogen safety

Baohua Jia
Hamid Arandiyan
Jan Hayes
Jianzhen Ou
Rajesh Sharma
Tianyi Ma

Hydrogen supply chain

Rajesh Sharma
Reina Ichii

Economics and costs

Ahmad Mojiri
Ashenafi Biru
Peter Stasinopoulos
Rajarathinam Parthasarathy
Sefa Churchill
Xavier Mulet
Zsuzsanna Csereklyei

Economics impacts

Carol Bond
Hamid Arandiyan
Peter Stasinopoulos

Hydrogen supply chain

Ahmad Mojiri
Gavin Mudd
Vinh Thai

Social context/ Social license

Carol Bond
Jan Hayes
Rajesh Sharma
Reina Ichii

Law, policy and standards

Carol Bond
Jan Hayes
Rajesh Sharma
Reina Ichii

Eldor Project

Proton battery promises cheap home energy storage that's kinder to nature

Engineers in Melbourne are vying for pole position in the global race to make a cheap rechargeable battery for storing solar energy that does not rely on scarce natural resources.

How to make hydrogen straight from seawater – no desalination required

13 February 2023, RMIT News

Researchers have developed a cheaper and more energy-efficient way to make hydrogen directly from seawater, in a critical step towards a truly viable green hydrogen industry.

Faster Cleaner Chemical reaction for hydrogen production

14 March 2023, Australian Academy of Science

The urgent need for solar energy, electricity and chemical energy conversion to become more efficient is the charge of Prof Tianyi Ma. Prof Ma's research has seen him awarded the Le Fèvre Medal, to recognise outstanding basic research in chemistry.

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