

THE INSTITUTE FOR FRONTIER MATERIALS

The Institute for Frontier Materials at Deakin University addresses some of the major challenges to society through innovations in materials design and performance.

We are focused on two broad themes:

- re-designing materials for a circular economy
- imparting materials with extraordinary functionality.

Within these themes, our researchers work across the following six key research areas.



Advanced Alloys

Our work on advanced alloys extends from fundamental to industrial scale. Our research is designed to increase profitability and competitiveness, extend product life and reduce energy consumption.

IFM metallurgy and materials researchers, working with researchers in artificial intelligence have created cutting-edge software that accelerates alloy design and optimises alloy processes, compared to traditional “trial and error” techniques.

Through the ARC Training Centre in Alloy Innovation for Mining Efficiency (mineAlloy) we are training innovators to design the world’s best highly customised, long-life, wear-resistant components. Our research involves rapid development of customised alloys that excel in severe mining conditions, using 3D printing, novel characterisation and through our networked training environment. These innovations will enable much needed efficiencies in the industry.



Carbon Fibres and Composites

Based at our Carbon Nexus pilot plant, a unique carbon fibre facility, we have a suite of equipment available to researchers and industry.

Carbon Nexus incorporates open-access infrastructure designed to manufacture carbon fibres, textile pre-forms and composites.

Our research themes were developed in response to industry needs.

- low cost carbon fibre
- high-performance carbon fibre
- surface treatment and sizing of carbon fibre
- rapid composite cure.

We are working on projects with industry leaders, such as Vestas and Boeing as well as smaller companies, to address problems and improve performance under these overarching themes.

Our researchers look at problems from the fundamental scale, eg surface chemistry of carbon fibre and composites to the design of products made from composites such as automotive components and defence apparel.

The Institute for Frontier Materials - Key Research Areas



Electromaterials

Developing reliable energy storage solutions is vital for a successful transition to renewable energy sources.

Electromaterials make up batteries, energy generators, separation cells and much more. Battery technology is a key focus for this area, which includes a prototyping facility for new generation batteries (BatTRI-Hub).



Fibres and Textiles

Our fibre and textile researchers are investigating ways to produce functional fibres and textiles, re-purpose and recycle textile waste as well as designing new materials and processes to add value to fibre materials.

Much of this research is carried out in the ARC Research Hub for Future Fibres, which is led by IFM. In partnership with several highly innovative companies and international research leaders, the Hub is accelerating transformation of Australia's traditional manufacturing industry to a vibrant future-fibre oriented advanced manufacturing sector.

Research in this area is also supported under the ARC Discovery and Linkage schemes, as well as by other national and international grants (eg ANFF, CRDC, Ford URP, Wellcome Trust).

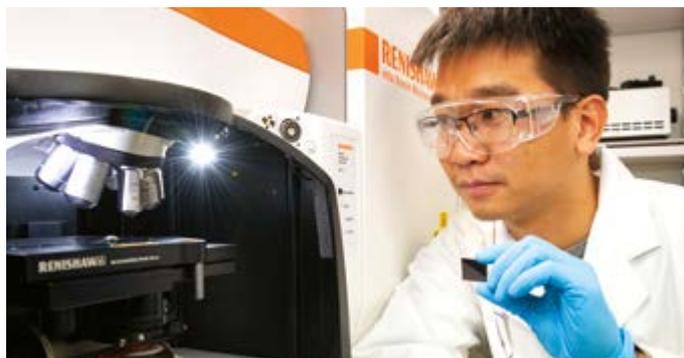


Infrastructure Materials

In this area, researchers are developing new solutions to address corrosion and durability of infrastructure.

We work in the construction industry (roads, rail, tunnels, bridges and buildings). Another major area of research is developing better materials (eg concrete mixes) to promote greater durability and/or improved sustainability.

In the area of corrosion prevention we work with desalination and water infrastructure, oil and gas refining and production, defence and aerospace, mining and power industries. Major areas of research are corrosion monitoring and prevention, bio-corrosion, and coatings and inhibitors for surfaces and interfaces. Some of this work is carried out as part of the Future Fuels Cooperative Research Centre.



Micro/Nano-materials

Developing novel micro/nano-materials is a way to address major challenges in energy storage, environmental protection and health and medicine.

IFM researchers were the first in the world to commercialise boron nitride nanotubes – a material with excellent mechanical performance and thermal conductivity. The group's research into boron nitride nanosheets has important environmental applications, such as water resource protection by removing solvents, dyes and other contaminants.

Development of micro- and nanoporous membrane materials is helping to address future biomedical and environmental challenges. The group's research focuses on fabrication and characterisation of membranes with unique micro and nanostructures, and surface properties for use in areas such as biological purification, gas separation and water treatment.