UNIVERSITY OF SOUTHERN QUEENSLAND
AUSTRALIA

Research

Centre for Future Materials

Innovation in Advanced Composite Materials

Industry partners

Australian Government
Department of Defence
Defence Science and Technology Group

AUSTRAK

CASC

CEMENT AUSTRALIA

Composite Advantage

crs Composite Reinforcement Solutions

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TEAKLE COMPOSITES

UNION PACIFIC

WAGNERS

Contents

Research

Centre for Future Materials

The University of Southern Queensland's (USQ) vision is to conduct world-leading research to help create world-changing results. USQ's Centre for Future Materials (CFM) is one of the leading research centres in Australia with a reputation for pioneering research and development in composite materials and geopolymers.

Centre for Future Materials

CFM was established in 2016 and has positioned itself to focus on collaboration with local, national and international SME's and large companies.

CFM's true strength is in industrial engagement and development, in order to develop personnel, IP, new products and open up new sectors through collaborative research programmes which utilises industry funding leveraged against state and national funding mechanisms in order to derisk the cost of research and deliver maximum impact for industry, the funding body and USQ.

CFM is working closely with industry and other research institutions to develop cutting edge technologies, through fundamental research and industry application in the area of advanced composites and concrete, and to provide solution-support to the community.

UNIVERSITY OF SOUTHERN QUEENSLAND AUSTRALIA

Research

Centre for Future Materials

Over 1000 industrial test clients

$5.4 M industrial contribution

17 active industrial clients

50+ researchers

Over 50% publications with international collaborators

$1.2 M new USQ investment

$5.7 M industrial contribution

351 5-year peer-reviewed publications

4 major international conferences as host institution

1 joint international research centre in China

16 academics

Executive Summary

This Capability Statement provides an overview of the current activities at CFM. The Centre prides itself as a leading Australian research centre in advanced materials. Our research priorities include advanced composite manufacturing, civil composites, functional materials, geopolymer and advanced concrete.

CFM has made a transformative progress in the first year of our operation. It's governance has enabled our members to take ownership and active roles through the integrated management structure. New USQ investment of $1.2M has been directed towards the key competencies and associated unique equipment. CFM research grants have reached the total of $5.7M, with the leveraged industrial funding of $5.4M. CFM currently holds one CRC-P project and six research grants from Australia Research Council. Strong industry links have been established alongside with the 17 active collaborative partners.

The Centre has recruited a number of world-leading researchers in aerospace composites and functional materials in order to support the growing aerospace and defence sectors in Australia. Along with their expertise, they also bring their networks in the sector from around the world. CFM is fully committed to link Australian industry with international collaborators.

CFM has been building its international identity through its YouTube channel, marketing, press releases and by hosting two major international conferences.

Our members of staff and students have been recognised for their outstanding performance. Professor Hao Wang has been elected as the Fellow of Queensland Academy of Arts and Science. Dr Allan Manalo has become a committee member for the new Standards Australia BD-108 as well as the Canadian Standards Association CSA807-15. The Centre has played a major role in excellent research publications resulting in our members and students receiving several publication excellence awards.

CFM is the founder of a joint research institute in China in the area of advanced materials and manufacturing, in partnership with The University of Queensland, and four universities in Zhejiang Province, China.

Next year CFM will continue to drive a significant growth in setting up the high impact collaborations with the high profile industrial partnerships in Australia and abroad. We are looking forward to hosting the 11th Asian-Australasia Conference on Composite Materials (ACCM).

Professor Peter Schubel

DIRECTOR, CENTRE FOR FUTURE MATERIALS

Leadership Team

PROFESSOR PETER SCHUBEL – THEME LEADER OF ADVANCED COMPOSITES MANUFACTURING

Peter Schubel is the Director of CFM and Professor of Composites Manufacturing. He received his PhD from the University of Nottingham, UK and joined USQ as the Director in 2016. He is a polymer composites materials and manufacturing engineer, specialising in the design and processing of high-value composite components and structures, focusing in particular on automated manufacturing, process development, advanced infusion processing, surface metrology, biocomposites and cost modelling for the aerospace, automotive and wind energy sectors. Over the last eight years, $40million has been awarded in research grants and external contracts.

DR XUESEN ZENG – CENTRE MANAGER

Dr Xuesen Zeng is Senior Research Fellow and Centre Manager at CFM. Xuesen joined USQ in Feb 2017, after 10 years of composites research at University of Nottingham, UK. His research focus is on low-cost and sustainable composite manufacturing processes. Dr Zeng has extensively applied finite element methods for the mechanical, fluid dynamics and thermal analyses in composite process modelling. Xuesen has run collaborative research with Airbus, Rolls Royce and SAFRAN Nacelles. Dr Zeng has been awarded $1.6M total in research grants, from a variety of UK government funding bodies as well as industry and has 45 publications.

DR ALLAN MANALO – THEME LEADER OF CIVIL COMPOSITES

Dr Allan Manalo received his PhD from USQ in 2010. His research interests include fibre composite materials and structures, sandwich structures, housing materials and construction technologies, timber engineering, structural testing and finite element simulation. Since 2010, he has published 23 high ranking journal articles. He is supervising five PhD and two visiting research students. He received the 2012 Faculty of Engineering and Surveying Research Excellence (Early Career) Award.

ASSOCIATE PROFESSOR ZHIGANG CHEN – THEME LEADER OF FUNCTIONAL MATERIALS

Dr Zhigang Chen joined USQ in September 2016. He has worked at The University of Queensland as ARC APD Fellow, QLD Smart Future Fellow, and Senior Research Fellow for seven years. His research concentrates on smart functional nanomaterials for thermoelectrics, nanoelectronics, and optoelectronics, from synthesising materials to understanding their underlying physics and chemistry.

PROFESSOR HAO WANG – THEME LEADER OF GEOPOLYMER AND CONCRETE

Professor Hao Wang received his PhD in Materials Engineering in 2001 from The University of Queensland. In the last 25 years, his research has spanned from metals, ceramics, composites and cement/concrete. He has published six books, four book chapters and 120 journal papers. His recent awards include an ARC Research Fellowship (2003), Queensland International Fellowship (2009), and Shanghai Science and Technology Award (2010).

In the CEEFC, Associate Professor Wang was the Research Program Leader for Biomass Composites and Green Cement/Concrete. He is also the CRC-ACS USQ Project Leader for Plant Based Biocomposites. He supervises eight PhD students.

Key People

PROFESSOR THIRU ARAVINTHAN

Professor Thiru Aravinthan received his Doctor of Engineering in 1999 from Saitama University, Japan. He joined USQ in 2002. His research interests include fibre composites for civil engineering structures and composite structural rehabilitation.

In CFM, Professor Aravinthan is the Research Program Leader for Civil Composites. He is also the CRC-ACS USQ Project Leader for Deep Water Composites.

DR SOURISH BANERJEE

Dr Sourish Banerjee is a Lecturer at USQ. His research interests include computational/theoretical modelling and experimental investigation of the mechanical behaviour of advanced composite structures, biocomposites, cellular materials and sandwich panels, material development and optimal design for applications and dynamic behaviour of cellular structures and composites.

DR POLLY BUREY

Polly Burey is a chemical and materials engineer with expertise in understanding fundamental relationships between microstructure, processing and rheological behaviour of food materials and bioplastics. Foods are intrinsically composite materials, and have some unique challenges in their analysis due to typically being soft-solid systems. Polly's past work has involved development of continuous processing of confectionery gels with Cadbury, understanding of how to classify safe dysphagia foods' microstructure and their rheology with RSL Care, and modelling of microstructure-rheology interactions with Fonterra. Her current interests lie in development of useful composite materials and ingredients from agricultural and food processing wastes.

PROFESSOR DAVID BUTTSWORTH

Professor David Buttsworth is an Associate member of CFM. He has research interests in re-entry aerodynamics, scramjets, impulse wind tunnels, instrumentation, internal combustion engines, and computational simulation. He is a Senior Member of The American Institute of Aeronautics and Astronautics.

DR REHAN UMER

Dr Rehan Umer has worked in many leading research institutes around the world. He received his PhD from the Center for Advanced Composite Materials, The University of Auckland, New Zealand in 2008. He then worked as a Research Engineer at CRC-ACS, Brisbane Australia for a year. From 2009–2012, he worked as postdoctoral researcher at the Composite Vehicle Research Center, Michigan State University, USA on polymer composites processing. Prior to joining CFM, he served as Assistant Professor Aerospace Engineering, and then Associate Professor/Director for Aerospace Research and Innovation Center, Khalifa University, Abu Dhabi, UAE. Dr Umer's research has been focused on advanced composites manufacturing covering both experimental and modelling studies.

DR VENKATA CHEVALI

Dr Chevali joined CFM in 2015 as a Vice-Chancellor's Research Fellow of Biocomposites. He received his PhD from The University of Alabama at Birmingham (USA) specialising in time-dependent mechanical properties of thermoplastic composites. Subsequently, he worked with industry-focused research programs in North Dakota State University (USA) and RMIT University (Australia) before joining USQ, where he focuses on developing multifunctional composite materials for a divergent range of high performance applications.

DR JAYANTHA EPAARACHCHI

Dr Jayantha Epaarachchi received his PhD from The University of Newcastle. He joined USQ in 2006 and is a Senior Lecturer. His research interests include fibre composites, static & dynamics analysis of structures, engineering design, experimental stress analysis and structural health monitoring. In CFM, He is the Research Program Leader for Smart Composites. He is also the CRC-ACS USQ Project Leader for Structural Health Monitoring.

DR LEI GE

Dr Ge joined USQ in March 2017. He received his PhD from The University of Queensland on carbon nanotube based membranes for gas processing. He then continued his research at UQ on ARC projects related to gas diffusion in porous materials and industrial projects on coal seam gas extraction. His research interests are now focused on developing novel materials for gas processing and low temperature electrolysis.

DR MAINUL ISLAM

Dr Mainul Islam is a Senior Lecturer at USQ. His research interests include biodegradable composite artificial reef system, behaviour of fibre composite sandwich panels, green composites for infrastructure applications and syntactic foams and foam-core sandwich composites. He is the principal supervisor of two PhD students and associate supervisor of three PhD/EngD students.

PROFESSOR KARU KARUNASENA

Professor Karu Karunasena received his PhD from University of Manitoba, Canada. His research interests include fibre composites, modelling and analysis of structures, rehabilitation of concrete, steel and timber structures, structural health monitoring, and wave propagation in composite materials. In the CFM, Professor Karunasena was the CRC-ACS USQ Project Leader for Structure Repair and Rehabilitation (completed in 2015) and he is currently the USQ Project Leader for the CRC-BNH (Bushfire and natural hazards) project titled 'Enhancing the resilience of critical road infrastructure'.

DR WEENA LOKUGE

Dr Weena Lokuge joined USQ in 2010. Her research interests include green construction materials-polymer concrete, geopolymer concrete, constitutive behaviour of construction materials, concrete structures – rehabilitation and resilience of road infrastructure in extreme events.

DR GINGHIS B. MARANAN

Dr Ginghis B. Maranan completed his PhD degree at USQ in 2016. His research interests are focused on structural analysis, structural testing and investigation, analytical modelling and simulation, reinforced concrete and FRP-reinforced concrete systems, earthquake engineering, and fibre composite materials for civil engineering applications. He has successfully implemented several industry-focused projects that resulted in 17 technical papers published in high-ranking international journals and refereed conference proceedings. He is currently supervising one PhD and four masters students.

DR ALI MIRZAGHORBANALI

Dr Ali Mirzaghorbanali started his research career around a decade ago in leading and reputable Australian Universities in WA (Curtin University) and NSW (University of Wollongong) and in close collaboration with industry. Ali has conducted his postdoctoral fellowship in Rock Bolting and Strata Control research group at the School of Civil, Mining and Environmental Engineering, University of Wollongong under the supervision of distinguished Professor Naj Aziz. Ali's research studies cover a wide range of applications in Civil and Mining Geomechanics. Currently, Ali focuses on cutting edge research studies in the field of Geotechnical Engineering in collaboration with industry and University of Wollongong.

DR CHAMILA SIRIMANNA

Dr Chamila Sirimanna received his PhD from USQ in 2015. He has worked on a range of industry funded projects. He has over 10 years of experience in academia and industry in the field of Civil/Structural Engineering. His research interests include fibre composite for civil infrastructure applications, composite structural rehabilitation, structural testing, finite element simulation and theoretical modelling.

ASSOCIATE PROFESSOR PINGAN SONG

Dr Pingan Song joined USQ in August 2016. His research interests mainly involve the design and synthesis of high-performance flame retardants for thermoplastics and the reinforcing, toughening and flame retarding of polymer composites using bioinspired strategies. Until now, he has published two book chapters and over 60 peer-reviewed journal articles with an H-index of 18. He is currently supervising two masters students.

ASSOCIATE PROFESSOR DAVID THORPE

David Thorpe is Associate Professor (Engineering/Technology Management) at USQ. He has research expertise in resilient and sustainable infrastructure including economic and sustainable life cycle analysis, sustainable engineering and technology management, engineering education with a particular focus on sustainability, and the role of advanced materials in sustainable and efficient engineering and construction. He has successfully supervised two Master of Engineering students and two Engineering doctorate students, has supervised two current PhD students to the point of submission of their theses for examination, and is currently principal supervisor of six other doctoral students.

ASSOCIATE PROFESSOR BELAL YOUSIF

Associate Professor Belal Yousif received his PhD from Multimedia University Malaysia in 2008. He joined USQ in 2010 and was appointed a Senior Lecturer in 2012. He has research interests in applied mechanics, tribology, polymeric composites and natural fibres. He is currently supervising seven PhD and six MSc students. Since 2010, he has published three book chapters and 30 journal articles. He is also the Member of the American Society of Mechanical Engineers.

DR ZUHUA ZHANG

Dr Zuhua Zhang obtained his PhD degree at USQ in 2014. He stayed at USQ as a research fellow and was promoted to senior researcher in 2016. His research interests include conventional concrete materials, geopolymer cement chemistry and materials, and manufacturing and industrial waste immobilisation and utilisation.

ADJUNCT/VISITING RESEARCHERS

PROFESSOR ALAN K T LAU
Professor/Pro-Vice Chancellor — Swinburne University

DR AIGUO WANG
Associate Professor — Anhui Jianzhu University, China

TECHNICAL/ADMINISTRATIVE STAFF

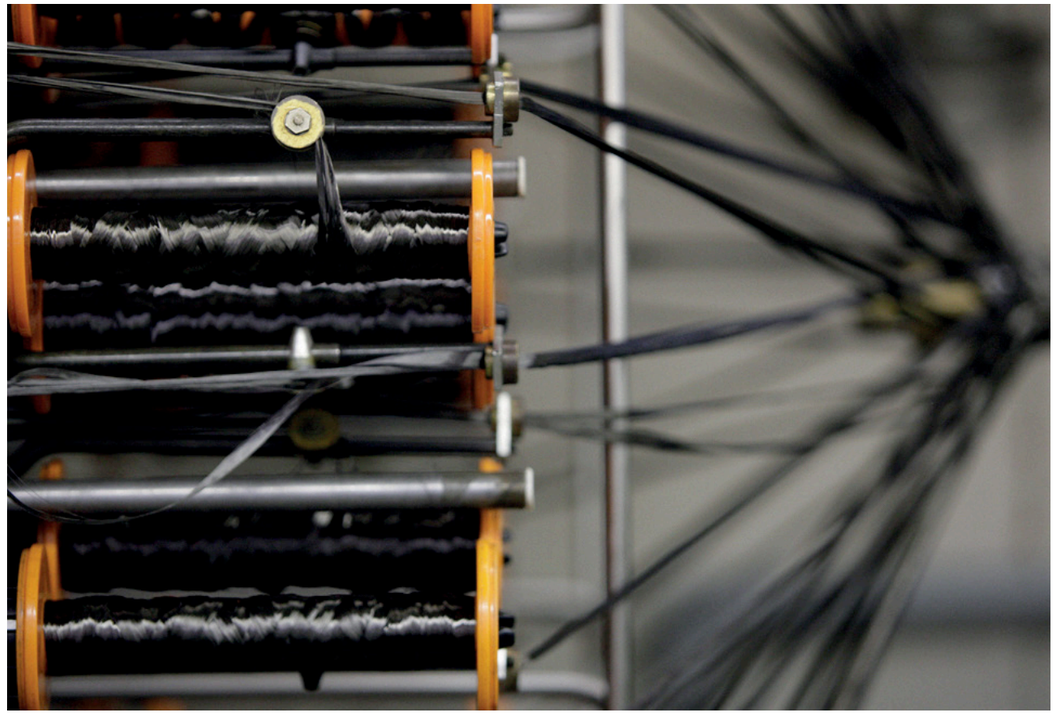
MR WAYNE CROWELL
Assistant Manager
(Structural Testing Services)

MR MARTIN GEACH
Operational/Safety Officer

MR BRIAN LENSKE
Laboratory Technician

Research Priorities

Advanced Composites Manufacturing	Functional Materials	Civil Composites	Geopolymer & Concrete
Theme Leader: Peter Schubel	Theme Leader: Zhigang Chen	Theme Leader: Allan Manalo	Theme Leader: Hao Wang
AFP	Nano	Rebar	Geopolymers
Pultrusion	Morphing material	Pilejax	High performance concrete
Repair	Energy material	Pultruded structure	
Smart process	Environmental material	Repair	
	Biomedical	Rock bolt	



Advanced composites manufacturing

High value composites manufacturing is a new capability brought to the Centre by Professor Peter Schubel. The research activities focus on automated manufacturing, process development, advanced infusion processing, and process modelling for the aerospace, defence and civil engineering sectors.

PULTRUSION PROCESS

The research focuses on the innovative pultrusion process, built upon our current expertise in pultruded components in civil, architectural, and marine applications. We have strong collaborations with Wagners – the largest pultrusion producer in the Southern Hemisphere. The study includes pultruded sandwich beams and profiles for low and high velocity impact load cases. Novel nano modified resins and reinforcement are developed for self-sensing and smart structures for civil applications. Fundamental research investigates the process integration of pultrusion and liquid composite moulding – resin wetting vs. high pressure injection in the die.

PERMEABILITY

Understanding permeability is key to minimising defect in liquid composite moulding process. CFM has developed state-of-the-art test rigs for measuring fibre reinforcement permeability. The devices are housed within a mechanical MTS testing frame, allowing for simultaneous compressibility and permeability measurements. X-ray computed tomography is integrated with a compaction fixture (5KN capacity) to perform 3D scanning of fibre reinforcement. The accurate measurement of permeability, deformation and loading are fed into an advanced process modelling framework supported by machine-learning algorithms. The closed-loop approach provides the foundation for process design and process control in liquid composite moulding.

COMPOSITES REPAIR

Sustaining Carbon Fibre Reinforced Plastic (CFRP) structures is a major challenge for aerospace vehicle operators. The research is to integrate computer simulation and real-time pressure field mapping, to repair degraded or damaged composite structures. To enhance the reliability of in-situ, out-of-autoclave, repairs of aerospace grade CFRP composites and reduce the reliance on skilled operators by:

- developing equipment to measure the key consolidation parameters with a focus on localised pressure fields
- understanding the link between the localised pressure fields during consolidation and repair defects, and
- integrating these into a practical process control solution.

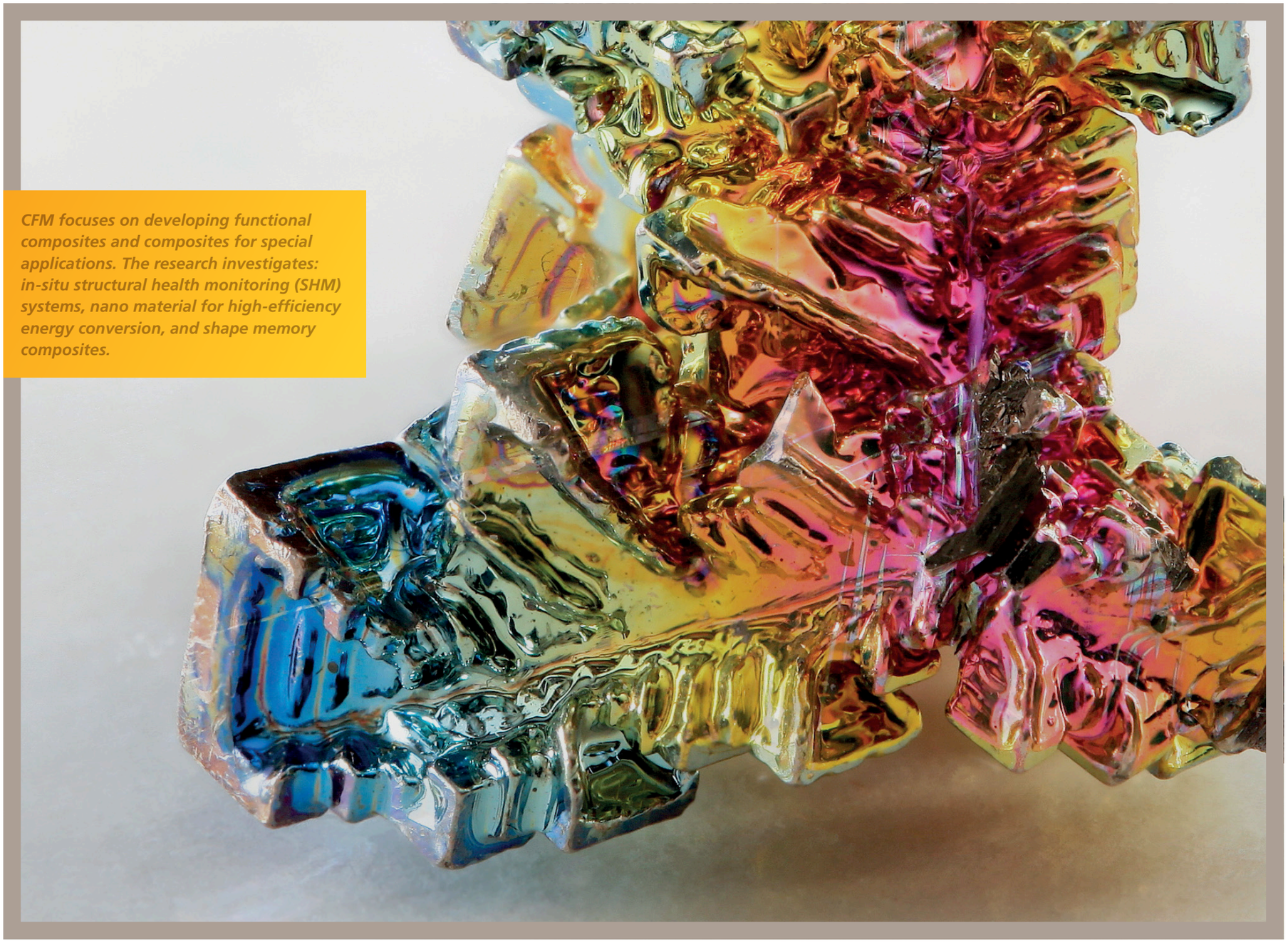
AUTOMATED FIBER PLACEMENT

Automation is vital for better productivity of these large structures. This project will lead to the establishment of a state-of-the-art automated fibre placement (AFP) research capability at CFM. This project will be key to ensuring the success and future growth of the aerospace sector in Queensland and Australia.

Key Objectives:

- A detailed understanding of the AFP process, including interactions with large aerospace manufacturers such as Boeing and Airbus.
- Development of state-of-the-art robotic work-bench and a fibre deposition end-effecter for the AFP process
- Address the scalability of the process to upgrade to a full scale AFP system.

Functional Materials



CFM focuses on developing functional composites and composites for special applications. The research investigates: in-situ structural health monitoring (SHM) systems, nano material for high-efficiency energy conversion, and shape memory composites.

THERMOELECTRIC NANOSTRUCTURES

The direct energy conversion between heat and electricity, based on thermoelectric effects without moving parts, has been considered as a green and sustainable solution to the global energy dilemma. This project aims to develop novel band-engineered (Bi, Sb)2Te3 nanomaterials for high-efficiency energy conversion using novel microwave-assisted wet chemistry approach, coupled with nanostructure and band engineering strategies. The key breakthrough is to design high performance (Bi, Sb)2Te3 thermoelectrics for satisfying the high efficiency solid-state devices. The expected outcomes will lead to an innovative technology in waste heat recovery and refrigeration, which will place Australia at the forefront of practical energy technologies.

SHAPE MEMORY COMPOSITES

Glass fibre reinforced shape memory polymer is being developed for smart engineering structural applications. It addresses the visibility of using light activation, shape memory performance, and shape stability of the glass fibre reinforced composites. Results reveal the addition of glass fibre has improved the mechanical characteristics of the shape memory polymer. The composites significantly improve the shape recovery rate, reduce the shape fixity feature and have no effect on original shape recoverability.

GRAPHENE NANOCOMPOSITES

Natural rubber (NR) nanocomposites achieves higher tensile strength and tear strength by almost 20% than pure NR. The nano composite material also has higher electrical conductivity than pure NR. Graphene, with tunable pore size on the graphene sheet, is used to fill the NR matrix, when fabricated by a chemical redox method. The Ag decorated graphene oxide is mixed into the NR matrix by electrostatic assembly. Results indicate the electrical conductivity of the NR composite with 10 orders of magnitude higher than pure NR. The study demonstrates the wider engineering applications of the nano NR composites.

COMPOSITES SENSING AND PREDICTION

Delamination is the most common failures in composite structures. Composite structural integrity is being assessed by coupling FBG sensors, infrared thermography and the advanced FE numerical analyses. The approach represents a simple and objective way for composite monitoring. A measurable change in the thermoelastic response can be detected even at relatively low strains, indicating the development of a delamination crack. The developed technique can be widely used because of its simplicity and objectivity.

Civil Composites

CFM has been leading the research and development of engineered fibre composites for civil infrastructure in Australia for more than 20 years. The research activities in Civil Composites include large scale structural testing, computational modelling and analysis of innovative composite structures for civil applications.

COMPOSITE REBARS

The non-conductive and non-corrosive composite rebar is used as internal reinforcement to concrete structures. CFM has played a key role to bring FRP bars into civil applications. For example, the Toowoomba City Hall refurbishment project adopted the composite rebar for the annex extension. USQ is one of the nominated organisations to lead the development of Standards for this alternative reinforcing material, which is strong, economical, safe and durable. The work we have undertaken provides an excellent framework for reference in the development of design criteria and specifications for FRP bars, so that the construction industry can benefit more widely from this technology.

COMPOSITE RAILWAY SLEEPERS AND TRANSOMS

Composite solutions are being developed to replace traditional timber sleepers and transoms. This project is developing a fundamental understanding of the design principles by looking to understand strain distribution at component and system level, then applying that to optimise composite materials, sandwich laminate design and production processes in order to create a cost effective, sustainable solution for the rail sector.

STRATA CONTROL COMPOSITE BOLT

The structural performance of concrete structures repaired with a novel FRP jacket is investigated through experimental and theoretical investigations. The constituent material's behaviour including the laminates and filler for the novel FRP jacket are evaluated. Compressive test of full-scale concrete columns repaired with fibre reinforced jacket under concentric loading and with different levels of concrete damage and steel corrosion are performed, with further finite element simulations.

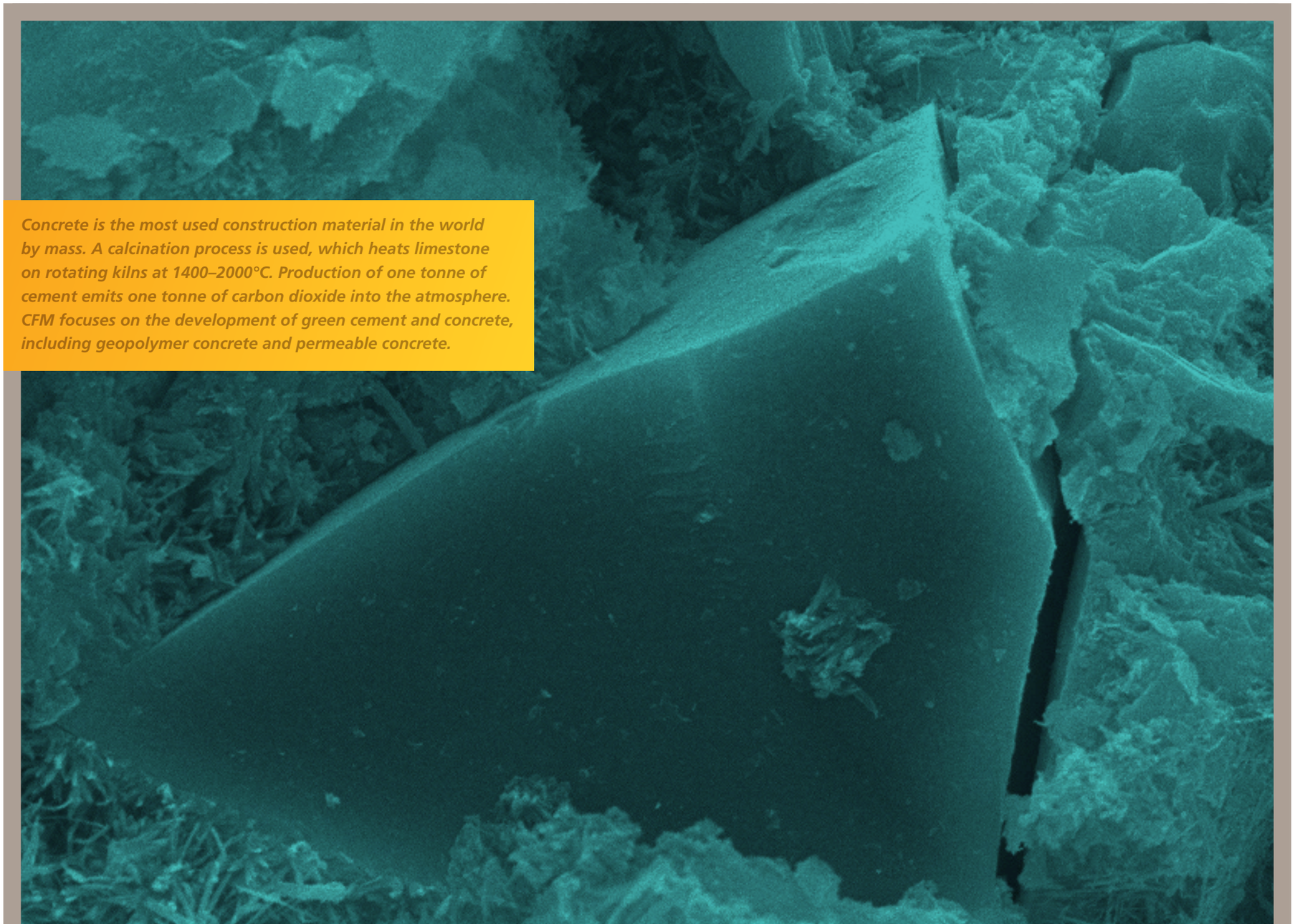
COMPOSITE JACKET FOR BRIDGE PILLAR STRUCTURAL REPAIR

The structural performance of concrete structures repaired with a novel FRP jacket is investigated through experimental and theoretical investigations. The constituent material's behaviour including the laminates and filler for the novel FRP jacket are evaluated. Compressive test of full-scale concrete columns repaired with fibre reinforced jacket under concentric loading and with different levels of concrete damage and steel corrosion are performed, with further finite element simulations.

PULTRUDED COMPOSITES

The structural performance of reinforced concrete slabs with pultruded hollow composite bars is studied experimentally and numerically. The results of this project provides the construction industry the proof-of-performance of this construction system and provide designers and engineers' valuable information to design reinforced concrete structures with hollow composite rebar.

Geopolymers and concrete



Concrete is the most used construction material in the world by mass. A calcination process is used, which heats limestone on rotating kilns at 1400–2000°C. Production of one tonne of cement emits one tonne of carbon dioxide into the atmosphere. CFM focuses on the development of green cement and concrete, including geopolymer concrete and permeable concrete.

GREEN GEOPOLYMER

Australia only uses 10% of its annual fly ash waste as supplementary cementitious material for the cement industry. This project aims to develop a well-formulated geopolymer, utilising high volume coal waste streams fly ash, as sustainable replacement of Portland cement. The study involves fundamental characterisation of geoplymerisation, development of a reactivity index system to evaluate fly ash, and process correlation between fly ash and resultant geopolymer product. This research will deliver a scientific method to design new geopolymer structures and produce the geopolymers with the most efficient alkali activation and predictable performance.

CONTROLLABLE AND DURABLE GEOPOLYMER CONCRETE

The focus is the effects of glassy phase and particle geometry of feedstock materials (fly ash and slag) on their reactivity, geopolymerisation mechanisms and the durability of derived geopolymers. The project develops innovative technologies on ambient temperature processing, efflorescence controlling and foaming. A large-foamed geopolymer concrete panel at a size of 400x700x50 mm was successfully cast without shrinkage crack. This project provides a commercially viable geopolymer production technology. The research places the Australian geopolymer sector at the leading edge of the green construction field and will enable the development and application of green building materials.

GEOPOLYMER PHASE ENGINEERING

The nature of different geopolymer phases, their formation thermodynamics, kinetics and stability are studied. Innovative phase engineering approaches ensures highly durable products, which are urgently needed but not available in the current industry. The outcomes are expected to eventually answer the last question for a wide application of geopolymer in durability. The knowledge will be extracted into ‘phase engineering’ and implemented into the concrete industry. This will entirely change current geopolymer concrete manufacture from trial-and-error practise towards a scientific design and prediction level.

SHRINKAGE AND PHASE CONTROL OF GEOPOLYMER FOAM CONCRETE (GFC)

The problems of shrinkage and phase control in scaling-up of GFC in industry are being addressed. An extensive experimental study identifies the key parameters to reduce the rate of drying shrinkage, including the variation of sand content, foam content, and using different fibre types and contents. The key mechanical properties of mixtures are evaluated experimentally and analytical models are developed for predicting the rate of drying shrinkage in long-term behaviour. The carbonisation shrinkage of GFC experimentally assesses the influences of severe environmental conditions (expose to 4% CO2) on the rate of drying shrinkage and mechanical properties of GFC.

Centre Outreach

CFM staff with Major Dr. Scott Robertson, from the Asian Office of Aerospace Research and Development (AOARD) of US Airforce Research Laboratories.

CFM has developed a wide range of research partnerships at regional, national and international levels. These research partnerships include industry partnerships, national collaboration and international linkages.

CHINA-AUSTRALIA INSTITUTE FOR ADVANCED MATERIALS AND MANUFACTURING

A joint research institute has been established between China and Australia in the areas of advanced materials and manufacturing. In China, the core member is currently Jiaxing University, with other associate members including Zhejiang University of Technology, Zhejiang University Ningbo Institute of Technology, and the Chinese Academy of Sciences Ningbo Institute. In Australia, USQ is the core member and The University of Queensland (UQ) an associate member.

NATIONAL COLLABORATION

Major national collaborations occur through the following platforms:

- USQ-UQ Alliance: The Alliance has been established due to the complimentary expertise and physical closeness of the two institutions. The alliance provides a platform for shared facility access and to jointly apply for competitive grants.
- USQ-Deakin Alliance: Deakin is the global player in research for the production of carbon fibre.

The other national collaborations and linkages include CSIRO, University of Melbourne, University of Southern Australia, RMIT, Monash University, Newcastle University, Defence Science and Technology Group (DSTG), Griffith University, and Queensland University of Technology (QUT).

INTERNATIONAL COLLABORATION

CFM has developed a number of active international collaborations:

ADVANCED COMPOSITES MANUFACTURING

EPSRC Future Composites Manufacturing Research Hub, UK

CIVIL COMPOSITES

University of Sherbrooke, Canada

Swiss Federal Institute of Technology, Switzerland

GEOPOLYMER AND CONCRETE

Sheffield University, UK

Human University, China

SMART MATERIALS

Harbin Technology Institute, China

Northwestern University, US

HIGH LEVEL TRAINING VIDEOS

INTRODUCTION TO FIBRE COMPOSITES

YouTube

http://yt.vu/BiYNjleFUD4

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