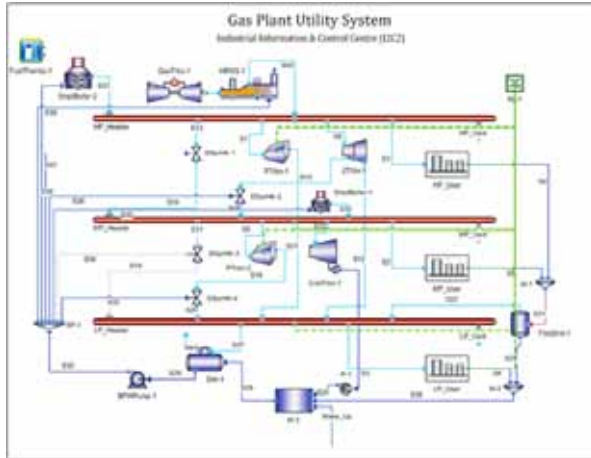


# Chemical & Process Engineering

## Energy and environment

Research is focused in the areas of oil & gas processing, thermal management using phase change energy storage for applications ranging from electronic devices to buildings, biodiesel & bioethanol, thermal management of aluminium smelters including recovery of waste heat, heat transfer and air flow, clean technologies and industrial waste treatment.



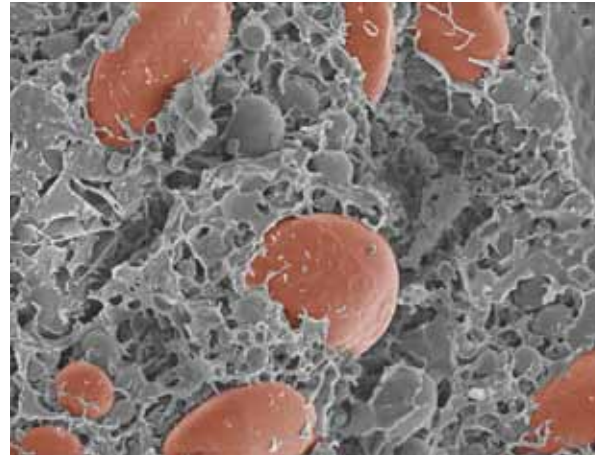
Modeling and optimization of steam utility systems for petrochemical process plants

## Separation and reaction engineering

Combining advanced chemical and materials engineering and science allows us to work towards developing and characterising world-leading innovative processes, with sustainable and environmental application. Research includes multiphase systems such as foams and fluidized particles, membrane separation, photo catalysis and wastewater treatment.

## Food and bioproduct processing

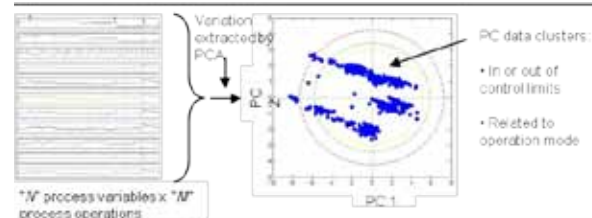
The focus of the group is the development of value-added food products and new, cost-effective food processing technologies. The work carried out is strongly focused on the interaction of processing routes with product performance, and includes thermal and non thermal processing, food microstructure, food microbiology, pharmaceutical processing, refrigeration and fouling mitigation.



Sourdough "starter" (*Scimbels hanksii*) imaged by cryo-scanning electron microscopy.

## Simulation and control

The Industrial Information and Control (I<sup>2</sup>C<sup>2</sup>) set up in 2008 has established itself as the premier National Centre for Industrial Information and Control, and provides a national focal point for research, postgraduate study, graduate training, continuing education and industry consultation in industrial information and control. World-class expertise in simulation and process control including developing control measurement strategies, process control of food processing, exergy and eco-efficiency of chemical and food/bio processes

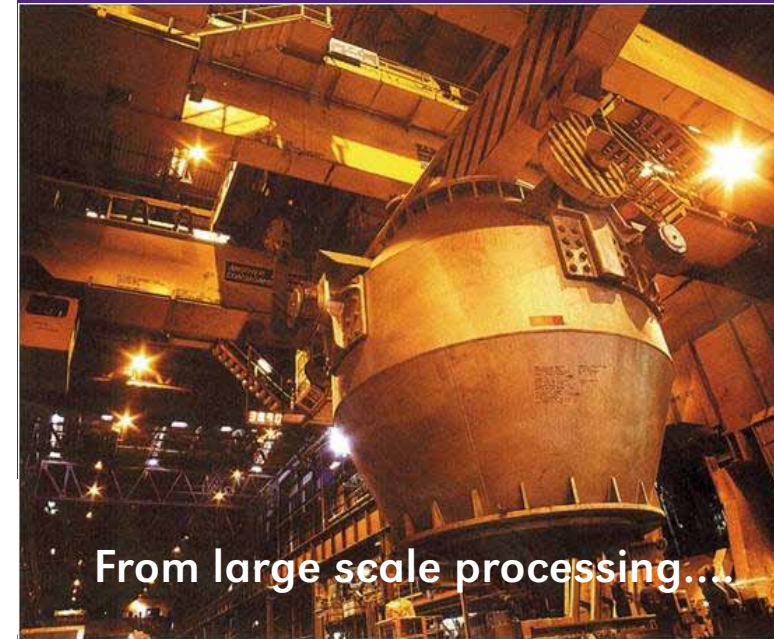


Example of 2. Principal Component Based Fault Detection  
Principal component based fault detection

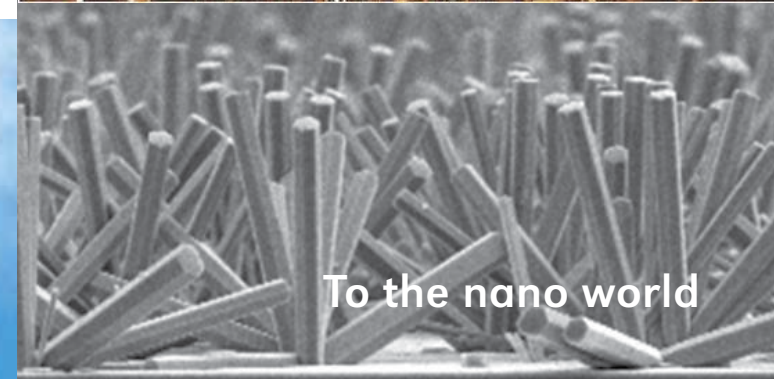
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**Faculty of Engineering**  
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## Postgraduate Research in the Department of Chemical & Materials Engineering



From large scale processing...



To the nano world

## Postgraduate Studies in the Department of Chemical and Materials Engineering

The Department is internationally-renowned in Chemical Engineering and Materials Science and Engineering Research. It was ranked as No. 1 Research Department at the University of Auckland and No. 2 in New Zealand in the 2006 Performance Based Research Funding (PBRF) evaluation. The Department offers PhD, ME, MEngSt and GradDipEng programmes. The main research areas in the Department include:

- Advanced Materials & Nanotechnology
- Bio-Medical Materials
- Ceramic Engineering
- Chemical & Process Engineering
- Corrosion & Protection
- Energy & Environment
- Food & Bio-Process Engineering
- Light Metals Technology
- Separation & Reaction Engineering
- Metals & Alloys
- Process Modelling, Simulation & Control
- Surface Science & Engineering

## Advanced Materials Research

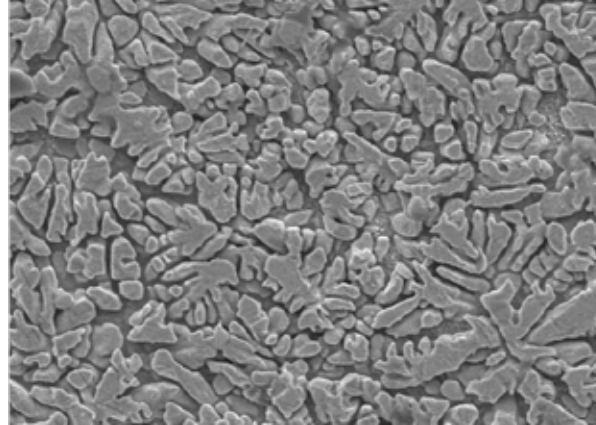
This area includes research on metals/alloys, polymers, ceramics, composites, electronic materials, bio-materials, nano-structured materials, coatings, thin films, mechanical properties, corrosion, oxidation and surface protection, and electron microscopy. Research is balanced with materials processing, microstructure, properties and performance, and enjoys a high-international reputation. Top-level publications and industrial applications are emphasized in our research.

## Research in Chemical & Process Engineering

Research areas include aluminium smelting technology, heat exchangers, process control & modeling, iron and steel making, waste water treatment, food & dairy processing, membrane separation, phase change materials for energy application, bio-fuels, UV and high pressure sterilization etc.

## Materials Engineering Metals & Alloys

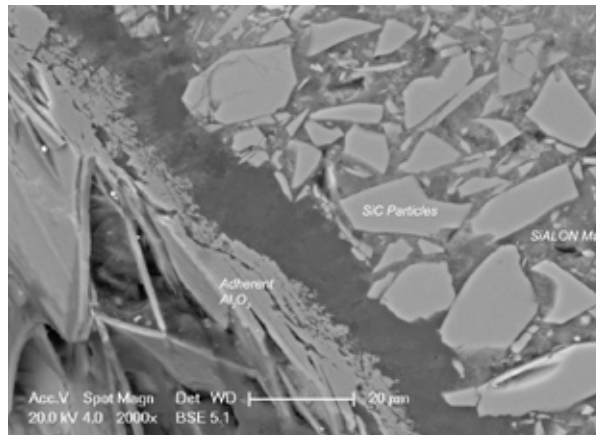
Research activities cover a wide area including light metals and alloys (Mg and Ti metals and alloys), aluminum and iron smelting, powder metallurgy, corrosion, oxidation, wear and fatigue. The research has strong links with the Light Metals Research Centre and receives strong support from the metals and manufacturing industry.



Etched surface of a cast 70%Cu-30%Sn alloy subject to very high cooling rate

## Non Metallic Materials

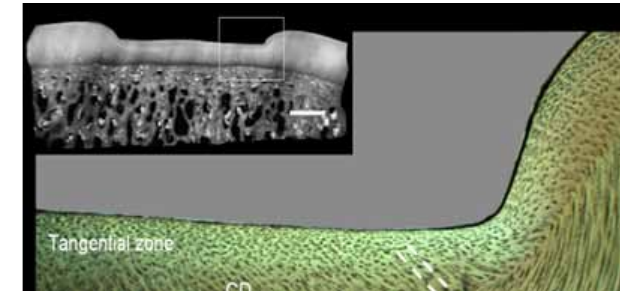
Research in non-metallic materials includes conducting polymers for photovoltaic applications such as solar cells and sensors, and ceramic processing technologies for high performance, refractory, glass and bio ceramic applications.



Silicon nitride/silicon carbide ceramic composites

## Bio Materials

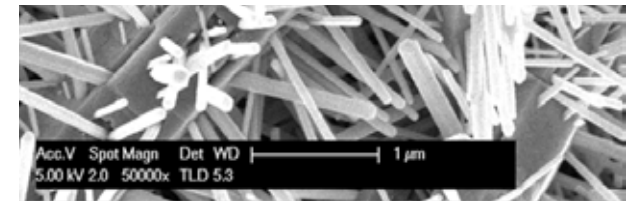
The Biomaterials Research Group has a strong foundation in experimental tissue mechanics, investigating the structure and function of complex biological materials. Research can be grouped into two broad areas of Joint Tissue Research and Spinal Research.



Cartilage deformation under load is imaged and studied using novel methods

## Coatings and Thin Films

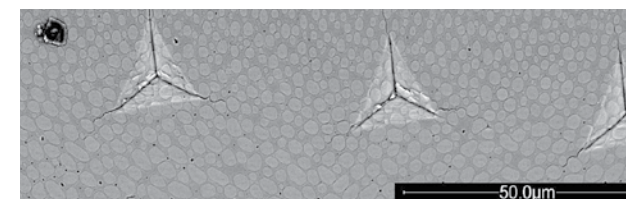
Novel processing techniques and materials, microstructural control, and property improvement of nano materials, coatings and thin films for electronic, protective and bio applications. Techniques include thermal spray, physical vapour deposition, oxidation and electrochemical processes.



Hydrothermally grown ZnO nano structures

## Materials Characterisation

The nanomechanical research group specialises in developing unique ways of measuring the mechanical properties of thin films, small scale and biological materials, whilst the Research Centre for Surface and Materials Science specialises in materials characterisation, in terms of composition and structure, from the very near surface to the bulk of the material.



Residual indent impressions from mechanical testing of composite using nanoindentation