Twelve academic staff, along with others from the Discipline of Chemical and Metallurgical Engineering and Chemistry and more than 30 PhD research students are active in four major research areas funded by the Australian Research Council, numerous mining companies and other organisations: (i) Extractive Metallurgy, (ii) Fire Safety and Combustion Kinetics, (iii) Geochemistry, Mineralogy and Materials Characterisation and (iv) Process Systems Engineering.

As one of the six Research Innovative Universities in Australia (http://www.iru.edu.au/), since 1975 Murdoch University has excelled in research to support Australian mineral industry and received high ratings for Resources Engineering and Extractive Metallurgy in the Australian Governments’ Excellence in Research for Australia (ERA) surveys.

Researchers in Fire Safety, Combustion Kinetics and Process Systems Engineering use sophisticated and world class computer, laboratory and pilot plant facilities for modelling and design to investigate cheaper energy sources, process safety and environment protection.

Geochemistry-mineralogy research at Murdoch focuses on fluid-mineral interactions, in particular on crystallisation of ore minerals, mineral replacement reactions, metal extraction and recovery, formation of metallic nanoparticles in minerals and synthetic compounds, amorphisation, dissolution and precipitation process, liberation and sequestration of radioactive elements, isotopic fingerprinting, carbonation reactions and storage of CO₂ in minerals. Our academics have expertise in a wide range of cutting-edge analytical and experimental techniques for mineralogical, chemical and microscopic characterisation of minerals, rocks and synthetic phases, such as in-situ X-ray diffraction, ICP-MS, IRMS, EMPA, SEM, TEM and nano-SIMS with distinguished records of publications, innovations and funding from external sources.

For further information

Staff are supported in the teaching and research programs by a range of industry specialists and adjunct and emeritus academics to add technical depth and knowledge breadth to these activities.
Research areas

EXTRACTIVE METALLURGY
- Developing more economical and sustainable processing methods for precious and base metals, uranium, rare earths and light metals
- Novel reagents and materials for mineral processing and metallurgical unit operations
- Atmospheric and high pressure, heap and in-situ leaching
- Separation and concentration by precipitation, ion-exchange and solvent extraction
- Metal recovery by reduction, electrowinning/refining
- Process water treatment
- Modelling gas/solid/solvent/surface interactions with electrolyte solutions relevant to mineral processing and metal extraction

FIRE SAFETY AND COMBUSTION KINETICS
- Formation of pollutants in fires
- Combustion processes and explosions
- Modelling of combustion processes
- Biomass combustion
- Chemical reaction kinetics
- Solid and spray fuel combustion processes
- Process safety, environment protection

GEOCHEMISTRY, MINERALOGY AND MATERIALS CHARACTERISATION
- Hydrothermal mineral formation and alteration
- Sequestration of CO₂ in carbonate minerals (mineral carbonation)
- Isotopic tracing of carbon sources in natural carbonation reactions
- Formation of microbialites in alkaline mining ponds
- Isotopic fractionation during carbonate formation
- In-situ synchrotron powder X-ray diffraction

PROCESS SYSTEMS ENGINEERING
- Modeling, analysis, control, optimisation, design
- Scheduling, risk assessment, design support systems, techno-economic assessment
- Planning, supply chain
- Crystallisation processes, leaching and solvent extraction operations, desalination and waste water treatment
- Biodiesel reactors, algal systems

Research funding and collaboration

- Australian Nuclear Science and Technology Organisation
- Australian Research Council
- Commonwealth Scientific and Industrial Research Organisation
- Curtin University of Technology, Perth, Australia
- Dyno Nobel Asia Pacific Pty Ltd.
- Heidelberg University, Heidelberg, Germany
- Korea Institute of GeoScience and Mineral Resources
- KTH Royal Institute of Technology, Stockholm, Sweden
- Monash University, Melbourne, Australia
- Norwegian University of Science and Technology, Trondheim and
- Research Council of Norway
- University of Cagliari and University of Florence, Italy
- University of Oslo, Norway
- University of Queensland, Brisbane, Australia
- University of Science and Technology, Hefei, China
- University of Toulouse, Toulouse, France

Research facilities
In addition to equipment listed overleaf, Fire and Combustion Kinetics laboratory houses triple quadrupole mass spectrometer, GC thermal desorption/FTIR spectrometer, micro-GC, TGA-DSC with dedicated FTIR, UV-Vis Spectrometer, Bruker electron paramagnetic resonance spectrometer, stopped flow with a fast UV-VIS spectrophotometer, and a range of supplementary instruments, such as ASE-150 accelerated solvent extractor, soxhlet extractor or rotary evaporator. Researchers have access to PC-installed Cosilab, Material Studio 8.0, Chemkin-Pro and Pawsey/NCI supercomputer-installed Gaussian09, VASP, DMol³ and ADF software packages for quantum-chemical and reaction-kinetics calculations.

Testimonial
After graduating with a Bachelor of Science from Murdoch University, Julie Shuttleworth made the right choice to take a job as a metallurgist in the mining industry. She made the right choice to get experience in the industry and work her way up to general manager. She then made a whole lot of right choices to be recently awarded Telstra West Australian Business Woman of the Year.

All of this began when she made the right choice to study at Murdoch. With world class teaching and research, facilities and a new degree structure that meets the demands of the world you’re now in, Murdoch is the right choice for your future.