Battery technology for energy storage solutions and electric vehicle transport systems

The Institute for Superconducting and Electronic Materials (ISEM) is a world-class cooperative research team examining the fields of energy, superconductivity and electronic material science and technology.

Led by Professor Shi Xue Dou, an internationally renowned expert in the fields of energy storage and superconductivity, ISEM has been instrumental in advancing these technologies in Australia.

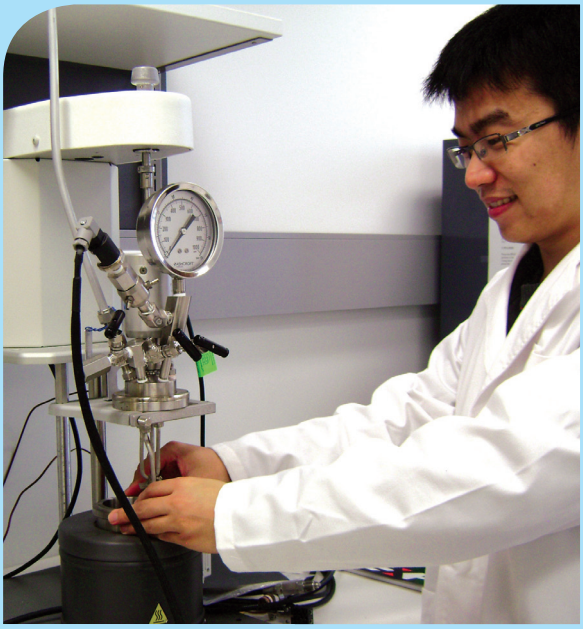
ISEM has a team of more than 100 researchers and postgraduate students with a track record of research breakthroughs that are helping to redefine the applications of electronic materials science.

Setting the standard in battery research

At the Australian Institute for Innovative Materials (AIIM) Facility, ISEM have established advanced battery testing and development facilities.

Their state-of-the-art laboratories are helping to reshape the processing electrode and electrolyte materials to help develop new energy storage solutions.

ISEM's facilities have set the new standard for battery testing facilities in the southern hemisphere.



Advancing battery technology

ISEM's battery technology research program is focused on developing low cost, high power rechargeable battery. This research program has already driven breakthroughs that have increased energy capacity and power density; enhanced battery lifecycle; improved operational safety; and the development of on-board charging mechanisms for electric vehicles.

ISEM's battery technology research, electrode and electrolyte processing facilities and state-of-the-art industrial battery laboratory are specially designed for electric and hybrid vehicle battery testing. This advanced battery research will help to transform battery technology and help develop complete energy storage solutions.

Contact us for more information

For more information on ISEM's battery technology and energy storage research program and commercial opportunities contact Professor Shi Xue Dou on +61 2 4221 5730 or via email at shi@uow.edu.au or visit ISEM's website at www.isem.uow.edu.au

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Projects to advance battery technologies being undertaken at ISEM include:

Project	Lithium ion batteries for Electric Vehicles (EVs)
Aims	To provide novel solutions to enhance the performance levels of lithium ion batteries for electric and hybrid electric vehicles.
Background	Electric vehicles (EV) and hybrid electric vehicles (HEV) are important to reducing carbon emissions, environmental improvements and reducing dependence on oil and fossil fuels. The Energy Storage Group at ISEM has been involved in research and development on advanced battery technologies in collaboration industry partners DLG Battery and Redarc Electronics. Advances are being made in the development of technologies for EV batteries. Several major breakthroughs in lithium ion batteries are being made to: ▪ increase battery energy capacity and power density ▪ enhance battery cycle life in hot weather conditions ▪ improve operational safety by adapting additives ▪ develop an on-board charger to meet requirements for fast charge/discharge without deterioration of capacity and cycle life of the batteries ▪ transfer the laboratory successes to an integrated battery pack and charger system to demonstrate new EVs and HEVs with high performance, safety and low cost
Techniques	ISEM's world-class industrial scale battery laboratory is equipped with facilities specifically designed for EV and HEV battery testing and features new state-of-the-art testing chambers and chargers. It is capable of testing up to complete battery systems of up to 450 volts for plug-in electric vehicles weighing more than 100 kilograms. Experts are available to use this equipment to test batteries technologies.

Project	Advanced ceramic nano-composites for high performance supercapacitors
Aims	To develop and study high performance nano-ceramic supercapacitors via industry scalable nanotechnologies.
Background	There is an increasing demand for novel energy storage materials which are able to address the limitations of classic lithium ion batteries. Enhanced cycle life, low cost, short charging times and high capacity are vital for most green energy applications especially for electric vehicles (EVs) which require ultra-high energy densities. Supercapacitors are the most promising replacement for lithium ion batteries in order to overcome current energy density limitations. This can be achieved by developing composite nano-materials which exhibit a dual energy storage charge mechanism, namely electric double layer and pseudo-capacitance or novel all solid state supercapacitors.
Techniques	We utilise high performance and industry oriented nanotechnologies including in-situ spray pyrolysis and soft-chemistry techniques to develop nano-composites of graphene and metal oxides providing low cost and superior performance above 700 F/g.
Ongoing tasks	Development of new nanotechnologies for specially designed nanostructured ceramic composites with high surface area in lithium ion capacitors.