ARC grant outcome of ISEM for 2017 round

This year ISEM has been exceptionally successful in attracting competitive funding from the Australian Research Council with project commencing in 2017. Members of ISEM academic staff and external applicants, who will join the Institute through ARC fellowships have secured one Future Fellowship, four DECRA Fellowships, four Discovery Projects and one LIEF. We have achieved 50% successful rate on the most competitive DP, compared to the national success rate of 17.8%. The total funding received for 10 projects is $4,062,000 for ISEM. The total UOW ARC funding for the 27 projects in this round is $9,815,500. Thus ISEM has contributed 41.4% of UOW total.

The details of successful projects can be found below. Congratulations to all successful applicants!

ARC Discovery Projects

DP170101467 - ***Two-dimensional plasmonic heterogeneous nanostructures for photocatalysis***
Prof. Shi Xue Dou, Dr. Yi Du, Dr. Xun Xu, Dr. Germanas Peleckis, Prof. Jinhua Ye, Prof. Weichang Hao, A/Prof. Lan Chen
Total funding received: $513,000
Project abstract: This project aims to design and explore two-dimensional heterogeneous photocatalysts that can convert solar energy into usable chemical energy. This project will investigate the correlation between surface plasmonic resonance and photocatalytic activities on the atomic level. Heterogeneous engineering and in-situ investigation of atomic-level photocatalytic dynamics is expected to yield several new full-solar-spectrum photocatalysts. The project is expected to contribute to the understanding of the processes and mechanisms underlying photocatalysis, and lead to useable, stable and durable photocatalytics. The outcomes will enable efficient, cost-effective and reliable production of clean energy in a low-emission way.

DP170102406 - ***Potassium ion batteries for large scale renewable energy storage***
Prof. Zai Ping Guo, Dr. Kosta Konstantinov, Prof. Xiong Wen Lou, Prof. Zhen Zhou
Total funding received: $493,500
Project abstract: The project aims to develop potassium ion batteries for renewable energy storage and conversion. Potassium ion batteries could be the most promising choice for large-scale electrical energy storage, particularly for renewable energy sources and smart electrical grids, due to their low cost, natural abundance and the advantages of potassium compared to lithium/sodium ion batteries. This study will research the electrochemical reactions and charge transfer pathway of electrode materials with excellent potassium ion storage performance. This project is expected to develop high performance potassium ion batteries and advance the prominence of Australia in the global renewable energy market.

DP170101773 - ***Liquid-phase hydrogen carriers for energy storage and delivery***
Dr. Zhenguo Huang, Prof. Hua Kun Liu, Dr. Haibo Yu, Prof. Xuebin Yu
Total funding received: $391,000
Project abstract: This project aims to overcome hydrogen storage and delivery issues by developing liquid-phase hydrogen storage materials with high hydrogen capacity, exceptional stability and that do not change phase during hydrogen evolution. This project will build on the recent synthesis of strategically important hydrogen storage compounds. The innovative liquid-phase hydrogen storage and delivery technology will enable effective usage of established liquid fuel distribution techniques and infrastructure throughout the country. The project would benefit renewable energy, chemical, and manufacturing industries, where new employment opportunities would be created.

DP170104116 - ***Atomically thin superconductors***
Prof. Xiaolin Wang, Dr. Zhi Li, A/Prof. Zhenxiang Cheng, Dr. Yi Du, Prof. Qikun Xue
Total funding received: $372,500
Project abstract: This project aims to explore two-dimensional superconducting materials and elucidate the origins of their superconductivity. High temperature superconductivity in single layer iron-based superconductors offers a platform for exploring superconductors with even higher critical temperature (Tc) and has aroused great hope of understanding the underlying mechanisms for high Tc superconductivity. This project is expected to introduce physics and materials, leading to a better understanding of the two-dimensional superconducting phenomenon and the discovery of physical phenomena for new electronic devices.

ARC Future Fellowships

FT160100251 - ***High-voltage electrode materials for lithium-ion batteries***
Dr. Wei Kong Pang
Total funding received: $652,000
Project abstract: This project aims to establish a complete battery research system and develop high-voltage electrode materials for lithium-ion batteries through mechanistic understanding obtained in operando studies. Lithium-ion batteries are the most promising choice for portable electronic devices, including electric vehicles, due to their high power and energy performance compared with other battery technologies. The success of this project is expected to advance fundamental understanding of lithium-ion batteries, and provide techniques to develop a promising high-energy and high-power battery system.

ARC Discovery Early Career Researcher Awards (DECRA)

DE170100871 - ***Carbon-based catalysts for polysulphide redox reactions in lithium-sulphur batteries***
Dr. Ji Liang
Total funding received: $360,000
Project abstract: This project aims to develop surface-engineered carbons as multifunctional catalysts to accelerate the polysulphide redox reactions for lithium-sulphur batteries. High capacity storage of electricity is the key to efficient use of renewable and clean energy resources and the development of emission-free technologies. This project will provide high-performance lithium-sulphur batteries with high energy density, high efficiency, and long life. Its success is expected to contribute to energy technologies, reduce the dependence of household and industrial energy consumption on fossil fuels, enhance Australia’s long-term viability, and bring economic, environmental, and social benefits to the nation.

DE170100928 - ***Room-temperature sodium-sulphur batteries***
Dr. Yunxiao Wang
Total funding received: $360,000
Project abstract: This project aims to develop silicon-based cathode materials for high-performance RT-sodium/sulphur batteries. These are expected to improve the sulphur electroactivity with sodium and supress the shuttle effect, achieving high energy density and cycling stability. This project will accelerate the sluggish electrochemical reactions between sulphur and sodium by embedding sulphur in hollow mesoporous carbon nanospheres, and modify the surface of the mesoporous carbon nanospheres’ host. A superior RT-sodium/sulphur battery with high energy density, a long cycling life, and stationary storage has potential to shift fossil fuels towards renewable energy system to power the economy in the long run.

DE170101426 - ***Electrode materials for sodium storage***
Dr. Chao Wu
Total funding received: $360,000

Project abstract: This project aims to develop phosphide-based electrode materials for high-performance sodium-ion batteries (SIBs) with high reversible capacity, superior rate capability and long cycle life. SIBs have great advantages in terms of low cost and infinite sodium resources, but the large size of the sodium-ion creates kinetic problems and a significant volume change for electrode materials. This project aims to design and synthesise phosphide-carbon hybrids with multi-scale, multi-dimension and hierarchical architectures as electrodes to overcome these problems. Expected outcomes include understanding the sodium-storage mechanisms, the size effect, and the architecture role for phosphide-based electrodes.

DE170100362 - ***Nanostructured metal hydrides for practical hydrogen storage applications***
Dr. Guanglin Xia
Total funding received: $360,000
Project abstract: This project aims to synthesise nanostructured metal hydrides with particle size smaller than 5 nm. The practical applications of metal hydrides as advanced solid-state hydrogen storage materials require substantial knowledge and delicate engineering of materials on the nanoscale. Combined with controllable modification on the nanoscale, the optimised metal hydrides will enhance the performance of hydrogen storage materials. This project is expected to advance understanding of the technologies of metal hydrides as hydrogen storage materials and develop practical applications of metal hydrides in storage tanks for fuel cells. Hydrogen energy could also reduce carbon dioxide emissions and alleviate air pollution.

LI170100020 - High bandwidth, high speed, terahertz optical sampling and analysis system
Professor Roger Lewis; Professor Chao Zhang; Professor Xiaolin Wang; Professor Anatoly Rozenfeld et al
Total funding received: $200,000
This project aims to promote scientific and technological research by providing access to a wide bandwidth, high speed, high resolution advanced terahertz spectrometer. Terahertz frequencies are the least-explored region of the electromagnetic spectrum and investment here is likely to yield scientific and technological reward. Expected outcomes are new commercial devices and products operating in the terahertz regime. The project's expected effects include new commercial terahertz products; better monitoring of explosives and toxins; research training and job creation; reduced risk in decision making, especially when monitoring water; and cultural benefits, through applying terahertz methods to artworks.

Total funding for ISEM	$4,062,000
Total funding for UOW	$9,815,500
% of ISEM/UOW	41.4%

In addition, our current VC fellow Dr Ting Liao has got FT-1 through QUT for $652,000 for family reason.