Capability Statement
Energy Storage Materials

About us

The nanotechnology team at the Institute for Frontier Materials (IFM), Deakin University is focused on developing new high-performance materials for energy storage applications. Our research strengths are synthesis of new nanomaterials as well as discovery of new properties and applications.

The team is composed of highly-skilled researchers in chemistry and electrochemistry, physics, materials science, environmental science, chemical engineering and modelling.

The outcomes of our research have been commercialised in two patented technologies: BN nanotube production; and Lithium-sulphur batteries.

Core Competencies

End of life PV panel applications

The team is leading this research with the following objectives:

- Develop green chemistry to recover critical components
- Develop a commercially scalable process to re-purpose high purity PV recycled silicon in dual-ion hybrid devices
- Develop novel commercial applications for recovered silicon and glass

High performance energy storage materials

We are developing new materials for cathodes, anodes, separators and electrolytes with high performance in energy density, cycle life, capacity, stability and rate capability for Li-ion, Na-ion, K-ion, Li-S batteries and supercapacitors.

Safe all-solid-state lithium batteries

Our research on high-performance all-solid-state lithium batteries focuses on new solid-state electrolytes, including organic polymer electrolytes, inorganic solid electrolytes, and composite solid-electrolytes.

Battery recovery and reuse

We are developing an environmentally benign process which will effectively recover lithium (Li), and other metals from the electrodes of Li-ion/S batteries.

Recycling waste boron nitride nanomaterials

Boron nitride nanomaterials are used in a number of large scale applications but these compounds are highly stable chemically, presenting significant challenges at end of life.

The following projects are underway to investigate high value reuse options:

- BNNT/BNNS-polymer composites as highly thermal conductive packaging materials for electronic devices
- BNNT/BNNS-metal/ceramic composites used as filler in metal alloy or ceramic matrix for high-temperature applications.

Differentiators

State of the art facilities

Our world class facilities include battery testing and facilities for materials synthesis and processing.

A prototype electrode production line, including a furnace with simulator, ball-mill and thermal spray dryer produces large quantity electrode materials for industry-scale application. The line includes a continuous rotary kiln, which can produce smart battery materials in kg quantities.

Successful research translation

A new start-up, Li-S Energy Technology Ltd. has been established to commercialize our patented Li-S battery technology and conduct prototype production with high energy density and improved safety for a number of applications.

Research Leaders

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