High performance semiconducting devices are synthesised chemically from nanomaterial and quantum dot colloids. These nanomaterials have applications in solar cells, batteries, renewable fuels and luminescent solar concentrators.

Competitive advantage

- World-record semiconducting quantum dot thin film solar cells using PbS and PbSe
- Creation of highly fluorescent non-toxic nanoparticles, Zn:CuInS2
- Vast experience working with and developing:
  - Low cost high efficiency chemically synthesized optoelectronic devices
  - A variety of oxide nanoparticles with good semiconducting properties
  - Tuneable surface chemistries in high performance nanoparticle systems
  - Inorganic Pb-halide perovskite nanoparticles with tuneable fluorescence across the visible spectrum
  - Magnetic nanoparticles, Fe3O4
  - 2D fluorescent and catalytic nanomaterials, MoS2 and WS2

Impact

- Enables extraction of energy from light in easily implementable/scalable ways, to harvest energy in unconventional locations, e.g. windows. Improvements in electrochemical energy storage. Efficient energy extraction from biomass-derived cellulose, making inefficient bioethanol obsolete

Successful applications

- World leading quantum dot solar cells in PbS and PbSe
- Highest recorded photoluminescence quantum yield from PbS quantum dots (unpublished)
- Lab-scale luminescent solar concentrators, with good performance
- Improved manganese oxide battery electrodes using doped nanoparticles
- Breakdown of cellulose into value-added products

Capabilities and facilities

- Chemical synthesis laboratory suitable for the fabrication of high performance colloidal quantum dot and nanoparticle synthesis by hydrothermal and ligand-based methods
- Fluorometer to measure photoluminescence efficiency across the visible spectrum and into the infra-red (approx. 400-1500 nm)

Our partners
• ClearVue Pty Ltd, Perth
• Natcore Inc, NY, USA
• Jinko Solar, China