DEAKIN AM CAPABILITIES (OVERVIEW)

Metal additive manufacturing

Structural & functional materials

- Titanium alloys & composites
- NiTi shape memory alloys
- Stainless steels & Invar
- Porous titanium structures
- Aluminum alloys
- Titanium aluminides
- Ni-based superalloys
- Tungsten & its alloys
- Powder modification & characterization
- Corrosion

AM techniques

- Laser powder-bed fusion: SLM280, SLM125
- Directed energy deposition: LENS
- Solid-state AM: MELD (Friction stir)

Applications

- Aerospace/space
- Biomedicine
- Energy – green hydrogen & hydrogen transport
- Automotive

Polymer additive manufacturing

Structural & functional materials

- Fibre reinforced composites
- Hydrogels
- PEEK & CF-PEEK
- Polydimethylsiloxane (PDMS)
- Multi-level porosity PDMS
- Graphene composites
- Carbon nanotube composites
- Diamond composites
- Silica composites

AM techniques

- Micro scale printing: BMF microArch S230
- Fused deposition modelling
- Selective laser sintering
- SLA
- Binder jetting
- Materials jetting

Applications

- Aerospace
- Biomedicine & dental
- Soft actuators & robots
- Energy – lithium-ion batteries
- Lab-on-a-chip
- Organ-on-a-chip
- Wearable sensors

Ceramics/glasses/pharmaceutical additive manufacturing

Materials

- Pharmaceuticals
- Ceramics
- Glasses
- Silicate glass
- Silica (with controlled multi-level porosity)
- Silicon oxycarbide (with controlled multi-level porosity)
- Silicon carbide (with controlled multi-level porosity)
- Carbon-enriched black glass (with controlled multi-level porosity and conductivity)
- Glass-ceramic composites

AM techniques

- Binder jetting
- SLA
- Glass printing

Applications

- Health – Wearable sensors and drug delivery
- Energy – Batteries, capacitors, electrolysers, fuel cells
- Catalysis
- Lab-on-a-chip
- Filters and Sorbents

Design for additive manufacturing & AM simulation

Structures & simulation

- Topology optimisation
- Lattice structures
- Self-supporting topologies
- Depowdering in binder jetting
- Microfluidic design
- Membrane and sorbent design

Software/techniques

- Flow-3D AM
- Discrete element method (DEM)
- Computational fluid dynamic simulations (CFD)

Applications

- Aerospace
- Biomedicine
- Energy storage and generation
- Extraction and filtration
- Desalination
- Chemical synthesis
- Catalysis

DEAKIN UNIVERSITY AUSTRALIA

CRICOS Provider Code: 00113B

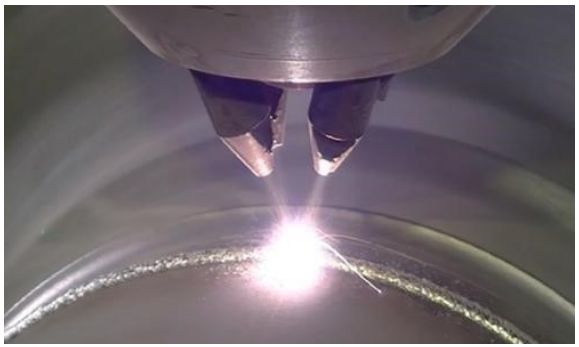
Capabilities in metal additive manufacturing

Powder based

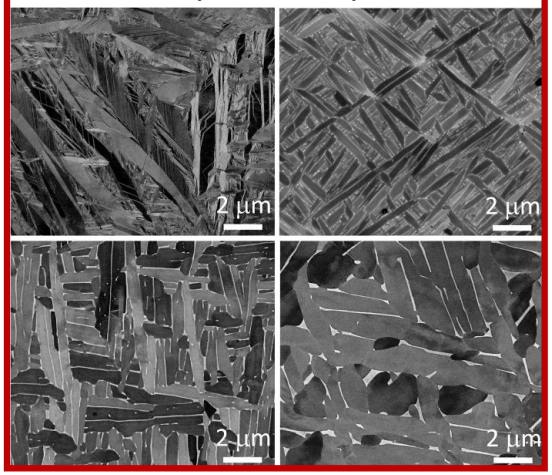
DEAKIN UNIVERSITY

Laser powder-bed fusion (SLM 280HL, SLM 125HL)

Laser-based directed energy deposition (LENS)

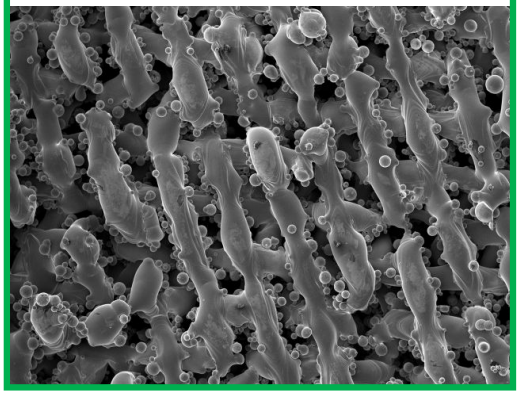


Real-time microstructure control (Ti-6Al-4V)

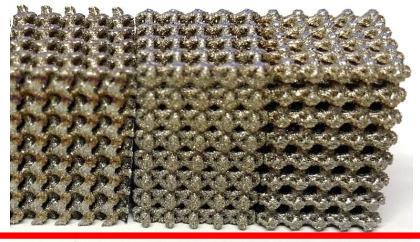


Corrosion (316L stainless steel)

Porous Ti for green hydrogen & hydrogen fuel cells



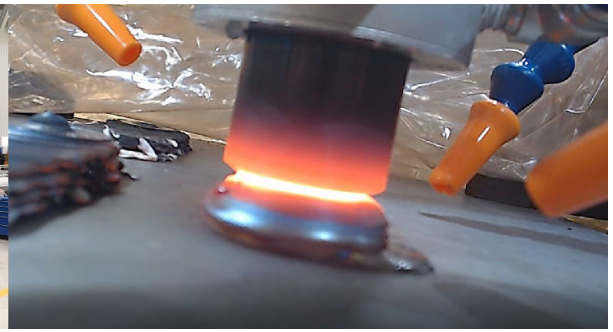
Fatigue-oriented NiTi shape memory lattice structures

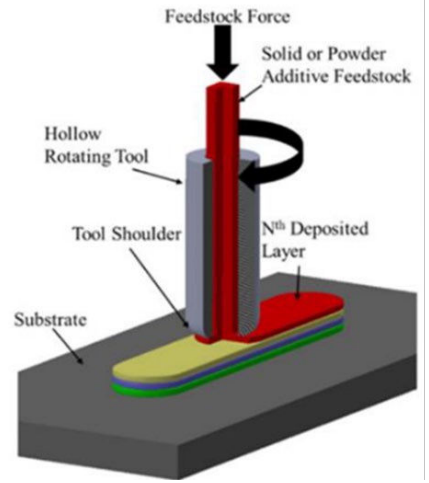


ASCEND Solar Car Project

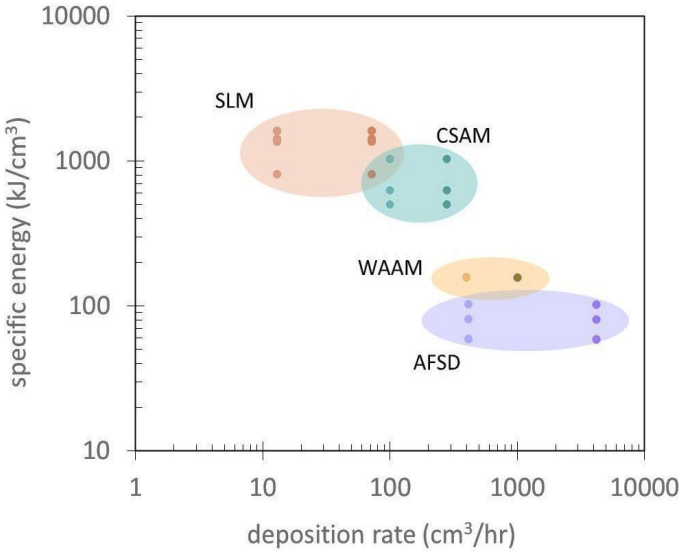
Additive Friction Stir Deposition (AFSD)

Solid state





- **Broad alloy compatibility:** Aluminium, copper, nickel, ferrous, magnesium, titanium, titanium aluminide.
- **Innovative recycling:** Solid-state recycling of alloy waste for sustainable manufacturing.
- **Large-scale 3D printing:** Rapid deposition rates for cost-effective production.
- **Versatile applications:** From cladding to repair, meeting diverse needs.



MELD Manufacturing

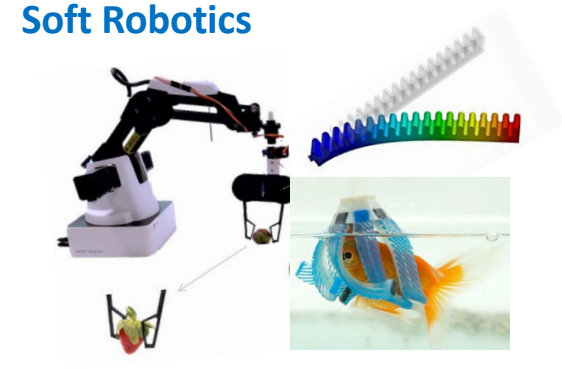
IFM INSTITUTE FOR FRONTIER MATERIALS

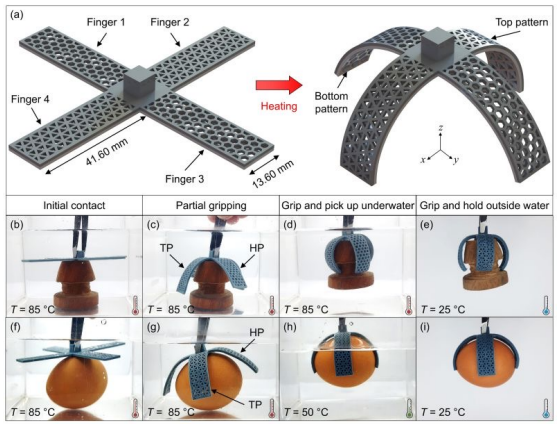
AM Capabilities in polymers, ceramics & composites

4D printing

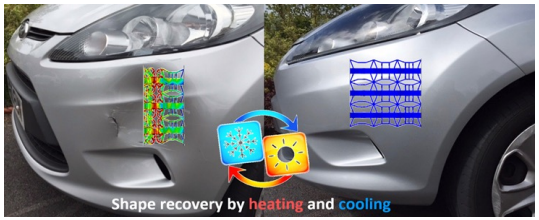
DEAKIN UNIVERSITY

Soft Robotics

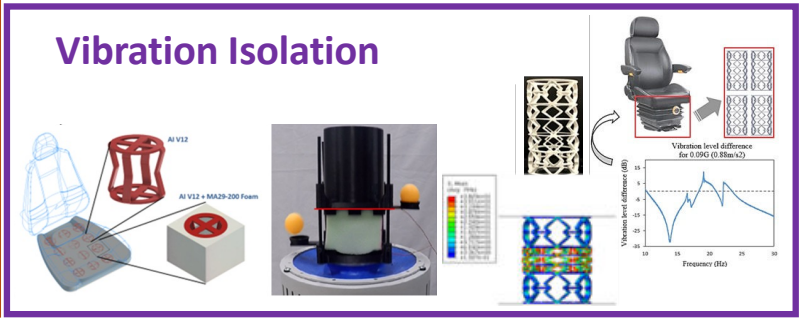




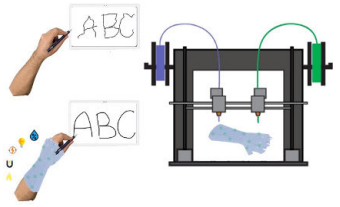
Reversible Energy Absorption

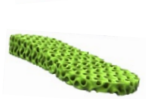


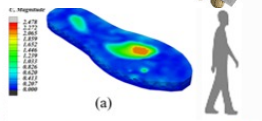
Vibration Isolation

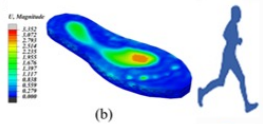


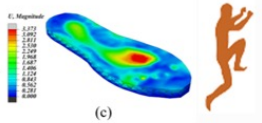
Medical Prostheses











AM Capabilities in polymers, ceramics, glass, composites & multimaterials

DEAKIN UNIVERSITY

HP MultiJet Fusion

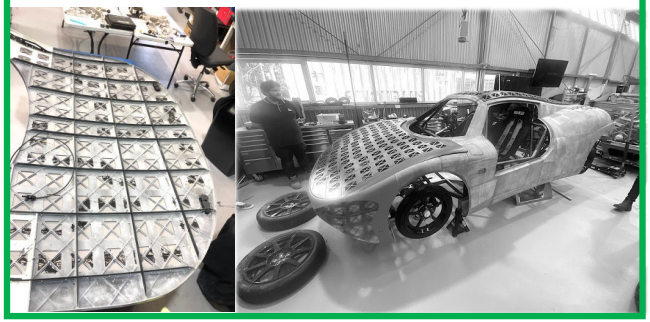
Connex PolyJet

Fortus

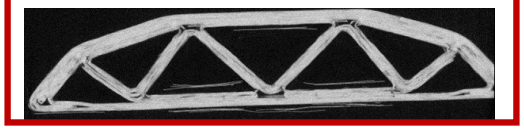
microArch S230

Markforged

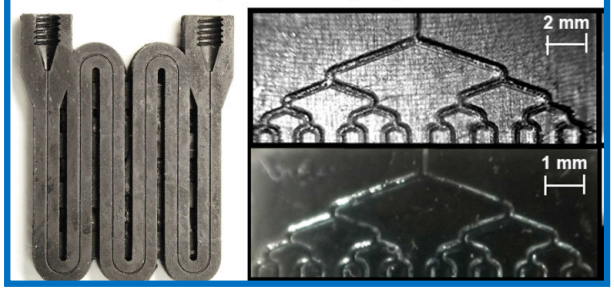
MJF printed external panel housing the solar arrays of the solar car

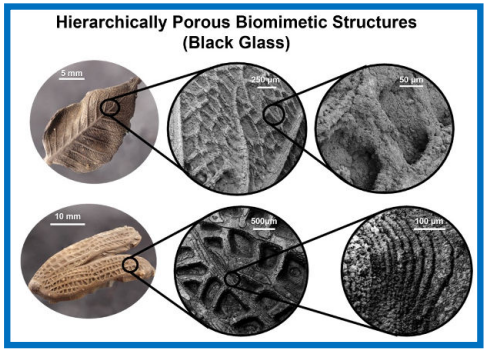


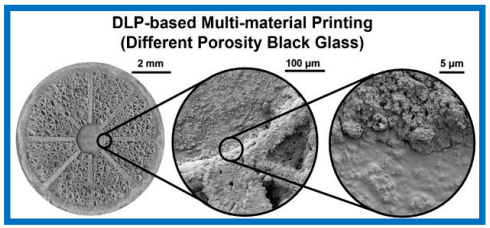
Hybrid composite 3D printing (continuous fibre)



Glass & ceramic microfluidics (sub-200 □m)







Large format glass


Thank you
Assoc. Prof. Wei Xu
wei.xu@deakin.edu.au
Tel: (03) 52273064
DEAKIN
UNIVERSITY