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

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Capabilities in metal additive manufacturing

Powder based

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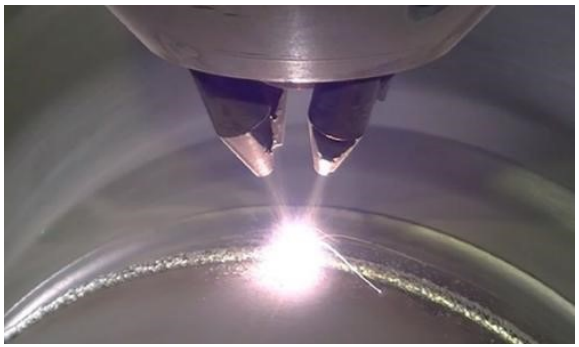
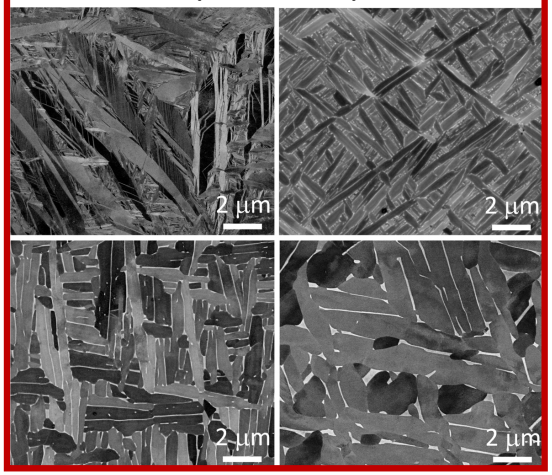
Laser powder-bed fusion (SLM 280HL, SLM 125HL)

Laser-based directed energy deposition (LENS)

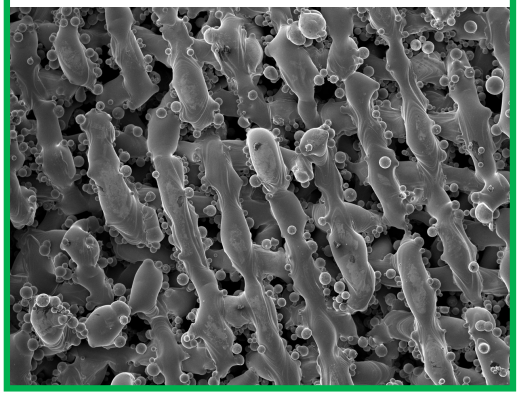


Real-time microstructure control (Ti-6Al-4V)

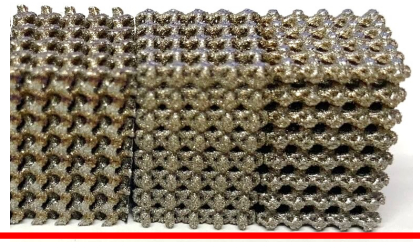


Corrosion (316L stainless steel)

Porous Ti for green hydrogen & hydrogen fuel cells



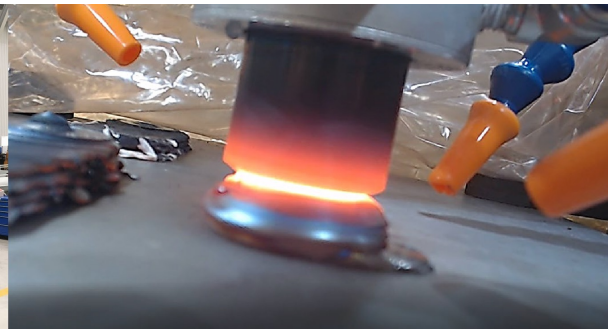
Fatigue-oriented NiTi shape memory lattice structures

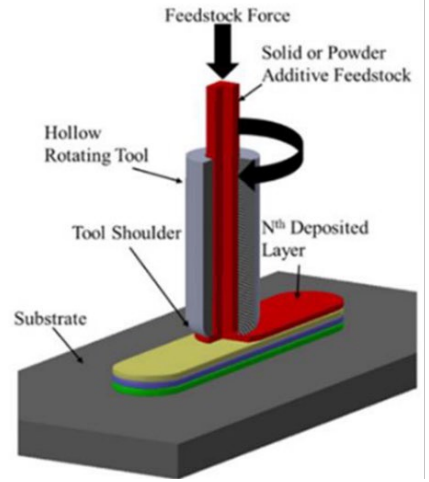


ASCEND Solar Car Project

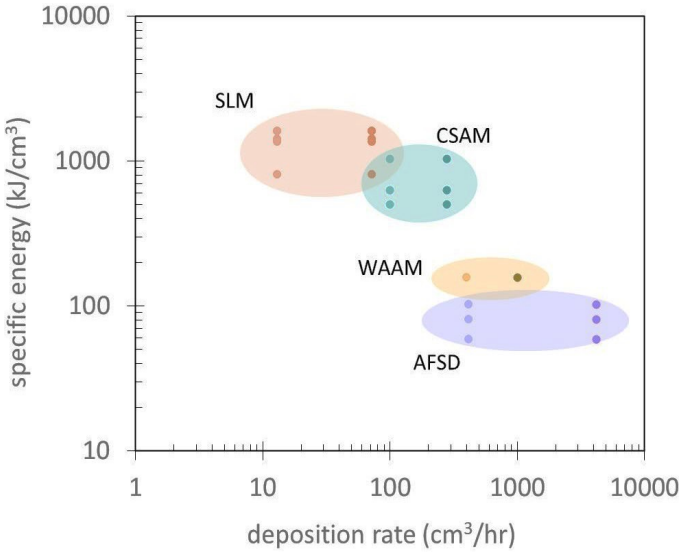
Additive Friction Stir Deposition (AFSD)

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

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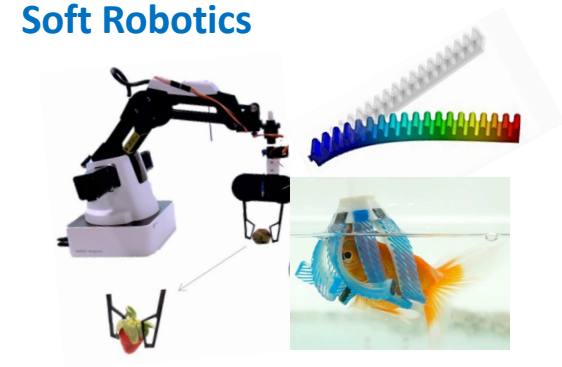
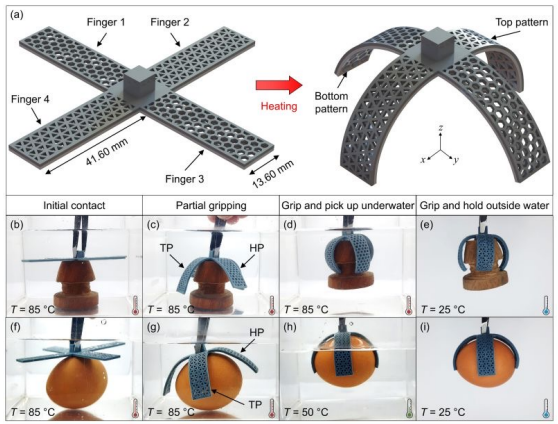
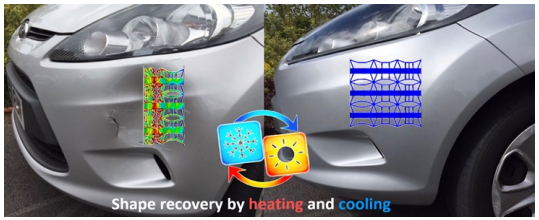
Soft Robotics

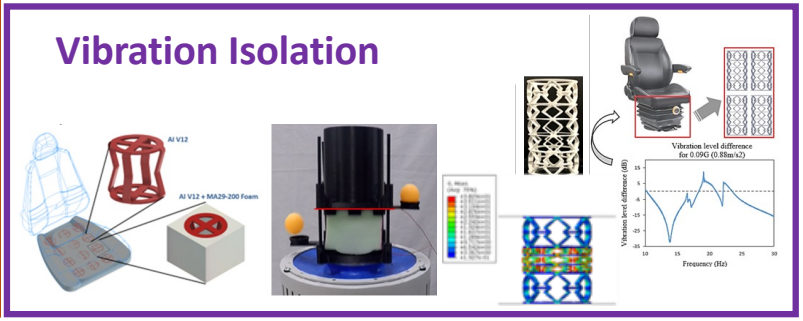




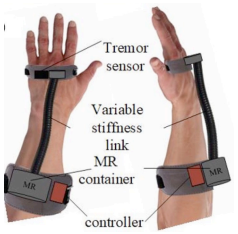
Reversible Energy Absorption

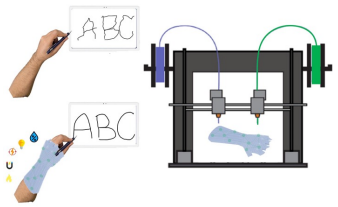


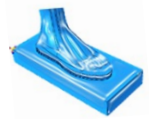
Vibration Isolation

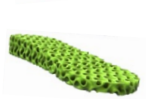


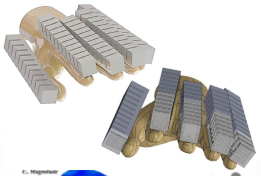
Medical Prostheses

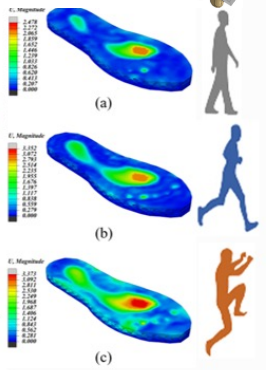












AM Capabilities in polymers, ceramics, glass, composites & multimaterials

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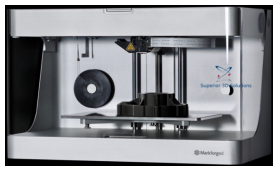
HP MultiJet Fusion

Connex PolyJet

Fortus

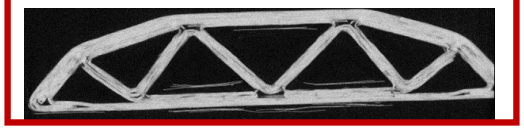
microArch S230

Markforged

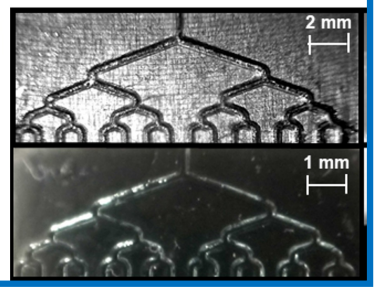


MJF printed external panel housing the solar arrays of the solar car

Hybrid composite 3D printing (continuous fibre)

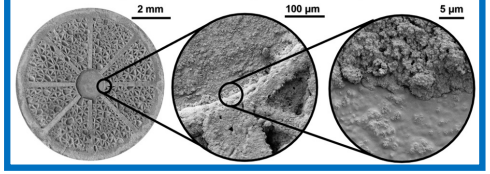


Glass & ceramic microfluidics (sub-200 □m)



Hierarchically Porous Biomimetic Structures (Black Glass)

DLP-based Multi-material Printing (Different Porosity Black Glass)



Large format glass


Thank you
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