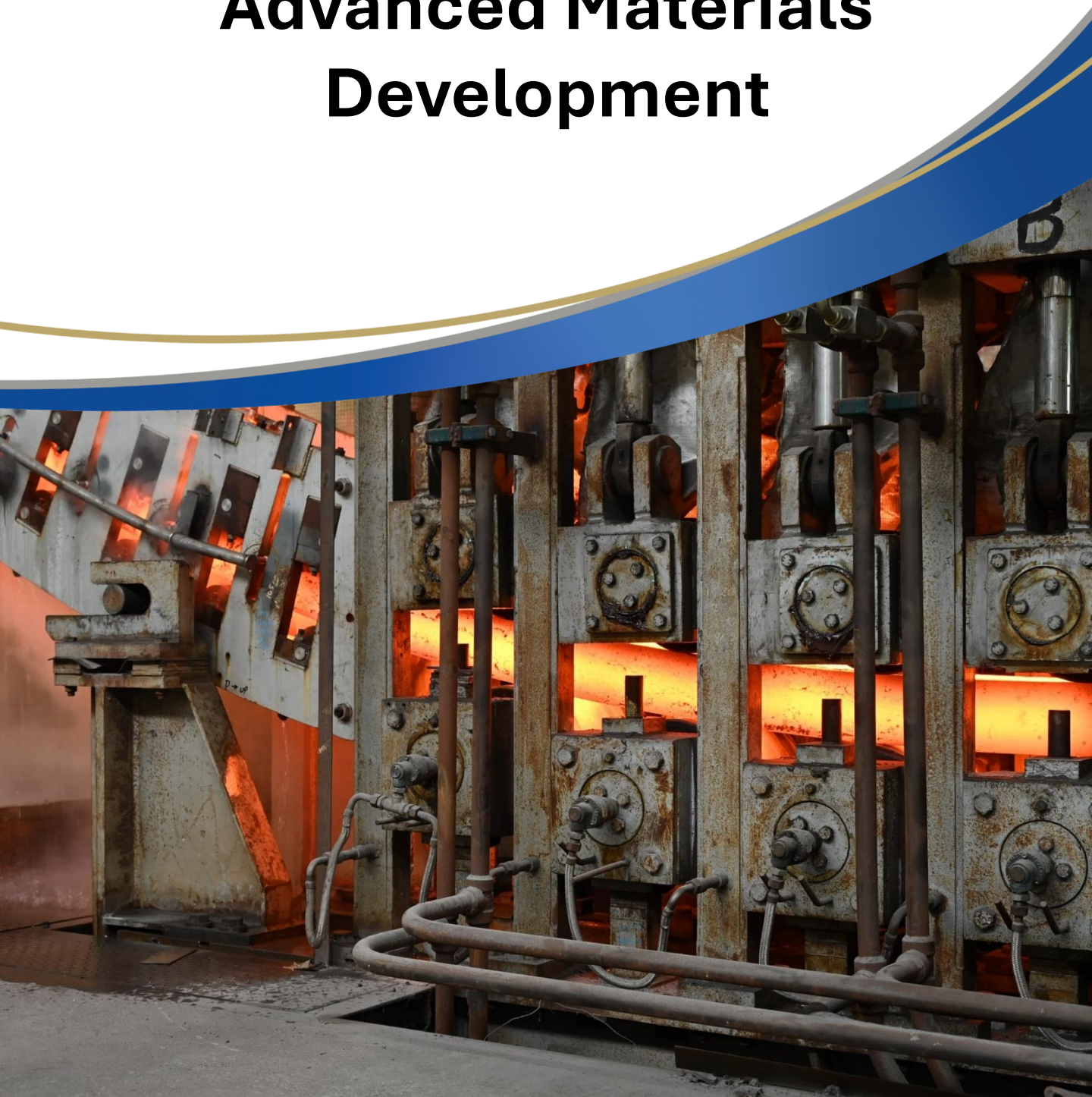
Materials Processing Institute

Services Portfolio

Advanced Materials Development



Advanced Materials Development

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Custom Alloy Development

Developing a heat-resistant superalloy	Create and test a nickel-based alloy for high-temperature applications like aerospace turbines.
Alloy design with critical material substitution	Develop an alloy that uses alternative elements to replace expensive or scarce materials (e.g. reduce Ni or Mo content.
Corrosion-resistant alloy development	Melt and test new alloy compositions aimed at superior corrosion resistance.
High-entropy alloy exploration	Create multi-component (5 or more elements) high-entropy alloys.
Shape memory alloy creation (e.g. NiTi)	Produce and thermally treat a shape-memory alloy and test its shape-recovery.

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Custom Alloy Development

Developing lighter, high-strength aluminium alloys for aerospace and high-temperature applications	Experiment with alloying aluminium with elements like Scandium or Magnesium to improve strength without sacrificing weight.
New solder or fusible alloy design	Formulate a low-melting alloy (lead-free solder or fusible plug alloy) with specific melting point and properties.
Custom alloy for electronics & semiconductors	Melt and refine a high-purity alloy for electronic applications (low magnetic, specific expansion coefficient, etc.).
Client-specific alloy prototyping	Work with a client's proprietary material concept, melting and casting a prototype batch under NDA to evaluate its potent.

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New Steel

Developing a new high-strength steel grade	Design and produce a novel steel composition (e.g., for automotive) and assess its properties.
Developing a new high-strength steel grade	Design a tool steel with improved hardness and toughness for machining or drilling applications.
Formulating a new stainless-steel alloy	Experiment with alloying elements to produce stainless steel with improved corrosion resistance or lower cost.
Prototype batch of advanced high-strength steel (AHSS)	Melt and process a small batch of AHSS (e.g., TRIP or TWIP steel) to evaluate its microstructure and tensile properties.
Nanoscale grain steel via processing	Develop a processing route to achieve ultra-fine grain steel for high strength and toughness.

Services Portfolio

Supporting R&D

Alloy solidification pattern study	Examine how different alloy compositions solidify by controlled pilot casting.
Lab-scale melting of new alloys	Melt very small (~1 kg) samples of experimental alloys for property evaluation.
Rolling and thermomechanical processing of prototype alloy	Process a lab-created alloy through rolling or forging to simulate industrial forming and evaluate its workability and properties.
Precipitation hardening study in new alloy	Investigate aging treatments for an alloy to enhance strength via precipitation (useful for aluminium or PH steels).
Mechanical property characterisation of prototype alloy	Complete suite of mechanical tests on a new alloy to ensure it meets application requirements.

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Supporting R&D

Creep and stress-rupture testing for alloy qualification	Evaluate creep resistance of a new high-temperature alloy under load at elevated temperature for extended durations.
High-temperature oxidation testing	Develop an alloy or coating and test its oxidation resistance at elevated temperatures over time .
Powder durability and storage testing	Test how a powder's characteristics change with storage.
Thermal analysis of powder (DSC/TGA)	Perform thermal analysis on powders to understand their behaviour upon heating.
Macro hardness testing (HB/HRC/HV)	Fast screening of heat-treatment outcome.
Micro hardness mapping (HV0.1–HV1)	Resolve gradients across coatings/cases/HAZ to validate processes.

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Supporting R&D

Developing novel alloys and composites using Laser Powder Bed Fusion (LPBF)	Develop a novel alloy optimized for 3D printing (better flowability, low cracking) and produce a small ingot or powder batch for testing.
Powder metallurgy route for new alloy	Create a new alloy via powder metallurgy (mixing elemental or pre-alloyed powders and sintering) for compositions hard to melt conventionally.

Services Portfolio

Additive Manufacturing & Powder Metallurgy

Tensile testing (room & elevated temperature	Generate design allowables and verify batch-to-batch consistency.
Impact testing	Assess toughness and ductile-to-brittle transition behaviour.
Elastic modulus & hardness by indentation	Non-destructive property checks for thin sections or small parts.
Accelerated aging of new material	Subject a newly developed material to high temperature and humidity in aging chambers to predict long-term performance.

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Additional Services

Remelting and purification of metal samples	Re-melt a metal sample to homogenise composition or remove inclusions for quality improvement.
Induction skull melting for reactive metals	Melt small quantities of metals that react with crucibles by using cold crucible (skull) technique.
Material upscaling from lab to pilot	Take a promising new material initially made at gram-scale and produce a larger batch (tens of kg) to assess scalability and consistency.
Small-scale alloy screening experiments	Melt multiple small (~1 kg) alloy samples with systematic compositional variations to rapidly identify promising formulas.
Development of fusion reactor materials	Create and test materials (alloys or composites) that can withstand extreme conditions inside nuclear fusion reactors.

Full Services Portfolio

Advanced Metals & Green Steelmaking
- Green Steel - Product Development - Process Improvement - Extra
Advanced Materials Development
- Custom Alloy Development - New Steel - Supporting R&D - Additive Manufacturing & Powder Metallurgy - Additional Services
Characterisation and Analysis
- Characterisation and Analysis
Critical Raw Materials
- By-product Valorisation - End of Life Process Development - Mine Tailing Valorisation - Piloting /Testbed Hosting - Process Scale-up - Process Optimisation
Sustainable Cement and Concrete
- Product Development - Process Improvement
Powder Analysis and Additive Manufacturing
- Powder Analysis - Additive Manufacturing - Powder Processing
Energy and Process Decarbonisation
- Feasibility Studies - Energy and Emission Optimisation - Process Optimisation - Leveraging Facilities
Facilities and Equipment

Full Services Portfolio

Training

Processes
- Ironmaking
- Desulphurisation or Iron
- Steel Plant Raw Material
- Primary Steelmaking
- Secondary Steelmaking
- Ladles
- Practical Steelmaking
- Stainless Steelmaking
- Electric Arc Furnace (EAF) Steelmaking
- Continuous Casting
- General

Supplementary
- Engineering
- Metallurgy
- Environmental Protection
- Management
- Research

Applications
- Circular Economy
- Digital Technology
- Analytical Techniques

Products
- Finished Goods

Materials Processing Institute
Eston Road
Middlesbrough
United Kingdom
TS6 6US

+44 (0)1642 382000
info@mpiuk.com
www.mpiuk.com

Materials Processing Institute

www.linkedin.com/company/materials-processing-institute/