The Materials Processing Institute

Past and Future Research

Chris McDonald
Managing Director
1. The Materials Processing Institute is to be formed by the divestment of Teesside Technology Centre from Tata Steel, as an independent research institute for the materials sector.

2. MPI is a not-for-profit company, limited by guarantee.

3. The Institute has four founding members representing metals, minerals, chemicals and the public sector.

4. The Institute includes:
   - EPSRC Industrial Doctoral Centre
   - Industrial technology commercialisation
   - SME Technology Centre
Materials in the UK

- Importance of Materials
  - Underpins manufacturing (foundation industry)
  - Eight great technologies
  - Identified by TSB as an enabling technology

- Industrial sectors have good research and innovation support, but more is needed for foundation industries:
  - LiME: EPSRC centre at Brunel, but focussed on TRL 1-3
  - HVM Catapult has identified a gap in metals processing

- Major challenges affecting global competitiveness and opportunity for inward investment
  - Common needs relating to energy intensiveness
  - Upscaling of breakthrough processes, e.g. graphene, nano materials,
  - Process integration of CCS

- Materials footprint is essential to secure advanced manufacturing in UK
Objectives of MPI

1. Innovation in the extraction and manufacture of materials
2. Materials selection and development to improve processing

In Service Performance
Life Cycle Sustainability

Materials Extraction
smelt, leach, mine
move, concentrate

Materials Processing
melt, refine, blend,
cast, shape, control

Component Manufacture
formulate, press,
form

Product Manufacture
assemble, integrate

AFRC, AMRC, CPI, WMG, …
Projects: Process Technology

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Projects: Design & Analysis
Projects: Gasification & Pyrolysis

- Multi-mode pilot gasifier
- Client space for syngas research
- Pyrolysis for alternative fuels
Expertise and Facilities

1. People
   - 100 research engineers and scientists
   - Process simulation, modelling, pilot plant and upscaling
   - World class expertise in process CO, CO2 and energy balances
   - Experienced process engineers and project managers

2. Unique World Class Facilities
   - Fully flexible pilot and demonstration facilities
   - Pilot raw materials and materials processing
   - Physical modelling (air and water)
   - CFD and numerical modelling
   - Thermodynamics laboratory
   - High temperature laboratory
   - Metallurgy laboratory
## Core Technology Areas

<table>
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<tr>
<th>Minerals &amp; Raw Materials</th>
<th>Materials Processing</th>
<th>Sustainability</th>
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<tbody>
<tr>
<td>- Increasing added value of basic raw materials</td>
<td>- Innovating for added value – alloying, measurement, control</td>
<td>- Energy - alternative fuels, integration, industrial symbiosis</td>
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<td>- Alternative sources of high value materials</td>
<td>- Novel upscaling &amp; design - Graphene</td>
<td>- Ethics - supply chain sourcing</td>
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<td>- New material supply - powders for additive manufacture</td>
<td>- Pilot &amp; demonstration - gasification, pyrolysis, near net</td>
<td>- Environment - integrating carbon capture</td>
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<tr>
<td>- Materials handling</td>
<td>- Materials sectors: metals, ceramics, composites, glass</td>
<td>- Paradigm shift - reuse, reconfigure</td>
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- Technology scale up – lab to pilot to commercialisation
- Simulation, modelling, design and instrumentation
- Thermodynamics and kinetics of high temperature processes
- ‘Big Data’ and numerical systems

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Strategic Research Areas

1. Graphene process upscaling and control

2. Powder production to enable additive manufacture

3. Process integration of carbon capture and storage

4. Step change energy reduction by reconfiguring end of life process and energy generation

5. Ethical assurance of materials supply chain
Technology Commercialisation

MPI Core Research
(Development and optimisation of industrial processes, new materials, energy efficiency and emission control technologies)

Industrial Services
(onsite support to implement and optimise manufacturing processes)

SME Technology Centre
(Faculties and Support for SME’s to develop and commercialise new products)

Sustainable and Ethical Supply Chains
(concepts, models and monitoring technologies)

University Collaboration at MPI
(Innovation in Materials, Processes and emission technologies)

TRL