



EXPERT METALLURGICAL SERVICES

‘Microscopy to Material Consulting’

Unlock material insights through our expert metallurgical testing and consulting services, offering cutting-edge analysis and solutions while ensuring precision and reliability in every result.





METALLOGRAPHY

The behaviour of metals stems from their microstructure, mainly because of unique fabrication methods and applied post-treatments such as heat treatment and welding. At Mett-Bio, we conduct a microstructural analysis to study the material's reaction to processing methods such as mechanical forming, heat treatment, and welding. Our comprehensive microstructural analysis also assesses components lifespan, material degradation properties, and solutions during failure analysis of creep and corrosion incidents. We organize a metallography through specific ASTM standards and image analysis software. Even better, we can perform high magnification inspections from 50X to 1000X, and even higher, using SEM, TEM, etc. Before we examine the physical structural composition of a metal, the specimen is prepared for analysis through rounds of cutting, grinding, polishing, etching, and mounting.

SOME CURRENTLY AVAILABLE SAMPLE PREPARATION METHODS ARE

- Precision cutting
- Silicon mounts
- Thermoset and thermoplastic mounting
- Cold mounting
- Hand grinding and polishing
- Immersion, swab and electrolytic etching

WE PERFORM TWO KINDS OF EXAMINATIONS:

- | | |
|---|--|
| <ul style="list-style-type: none"> ✓ Microscopic Examinations <ul style="list-style-type: none"> General microstructure Carburization and decarburization Grain size Plating and coating thickness Carbide precipitation Ferrite by manual point count Intergranular attack and oxidation Nodularity, nodule count, type of graphite form | <ul style="list-style-type: none"> ✓ Macroscopic Examinations <ul style="list-style-type: none"> Macro etch Weld penetration Grain flow |
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ADVANCE MATERIAL CHARACTERIZATION



TOPOGRAPHY

MORPHOLOGY

COMPOSITION

SEM study ?

Scanning electron microscopy can be used when the magnification requirements exceeds to the maximum limit of conventional light microscope. It's an advanced microscopy technique which utilises sophisticated instrument with additional image analyser. Over the time scanning electron microscopy has been used for wider application such as studying surfaces and particles, is one of the vital tool in failure analysis studies, visualization of texture or morphology of materials.

The interpretation of image produced by scanning electron microscope is a very distinctive task and only a capable expert can perform quality interpretation and increase understanding of material under stud

EDAX

EDAX (Energy-Dispersive X-ray Spectroscopy) analysis offers valuable insights for industries by providing detailed elemental composition and quantitative data of materials, essential for verifying purity and optimizing manufacturing processes. It aids in phase identification when combined with other techniques and supports microstructural analysis through elemental mapping, revealing distribution and potential defects. Additionally, EDAX is instrumental in detecting contamination and analyzing corrosion or wear, thus enhancing quality control, material selection, and process improvements.

CUTTING AND SECTIONING

SPUTTER COATING (CARBON, GOLD AND NON-CONDUCTIVE)

ETCHING

CHEMICAL

FIXATION

DRYING

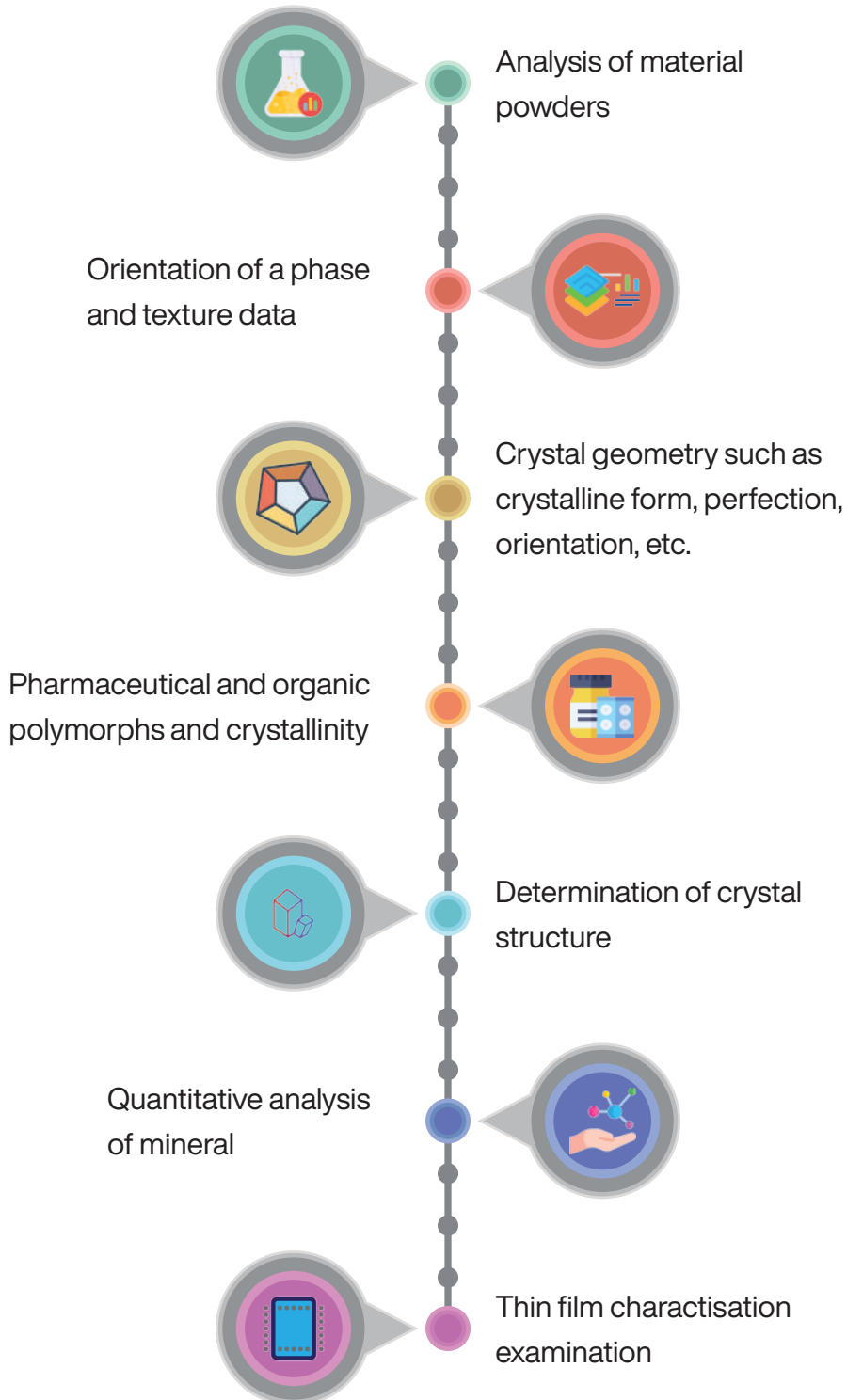
MOUNTING

GRINDING AND POLISHING

X-Ray Diffraction

X-Ray diffraction method is promising material characterization technique for crystalline materials. X-Ray

DIFFRACTION PROVIDES FOLLOWING:



IN-SITU METALLOGRAPHY

Mett-Bio's in-situ metallography offers real-time insights into material microstructures throughout their operational life. This approach enables direct observation and analysis of metal behavior under working conditions, allowing for the prompt detection of issues such as material degradation, phase changes, and structural alterations. By incorporating in-situ metallography into maintenance and quality control practices, industries can proactively identify and resolve potential failures, improve material performance, and extend the life of essential components, resulting in greater reliability, minimized downtime, and cost savings.

01

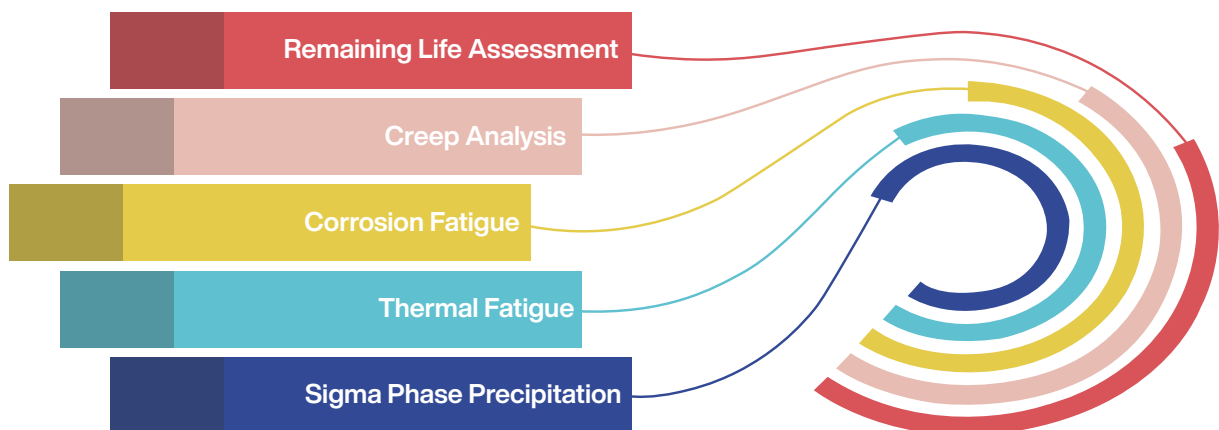
**Real-Time Process
material Monitoring**

02

**Cost-Effective
Troubleshooting**

03

**Immediate
feedbacks**



METALLURGICAL CONSULTING

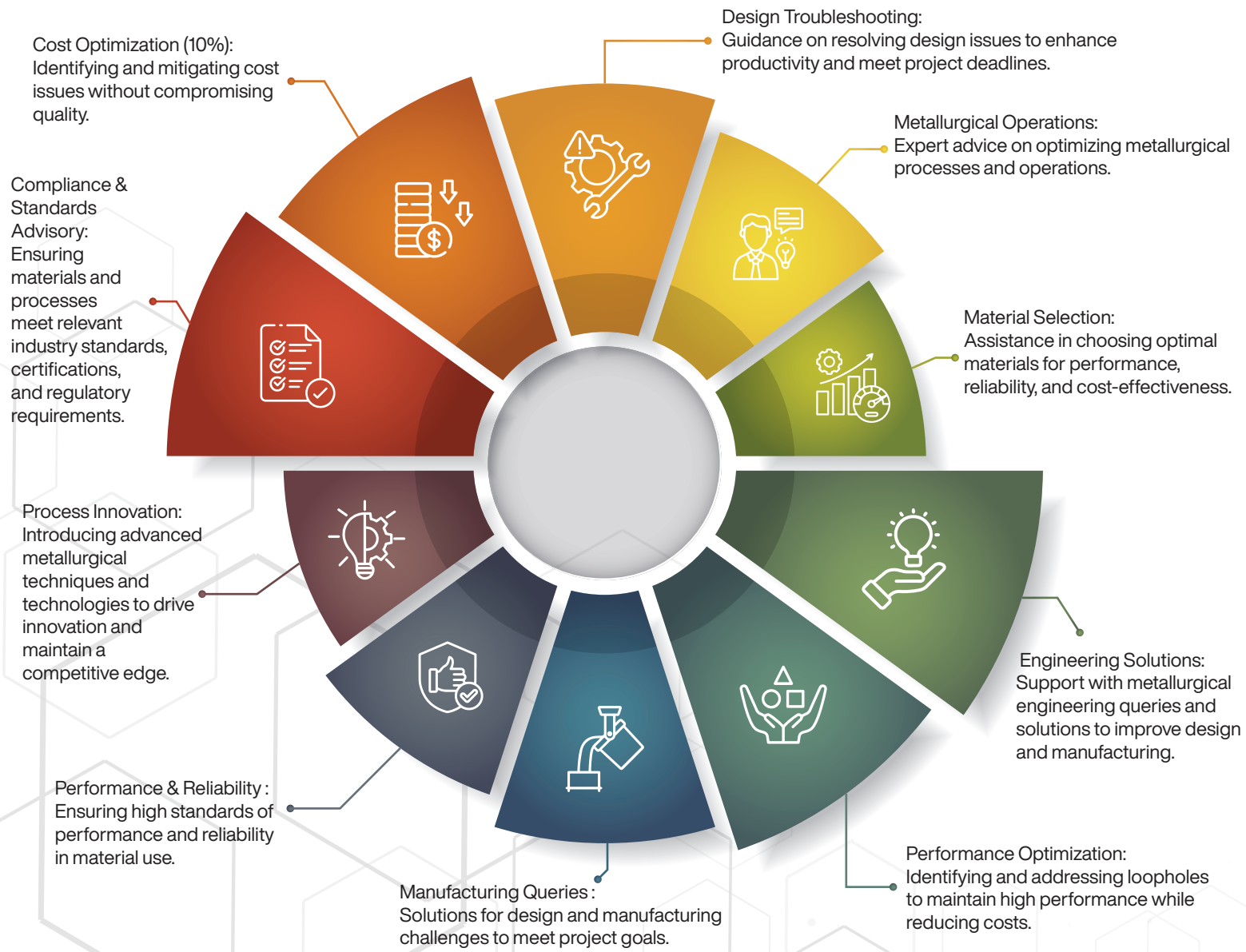


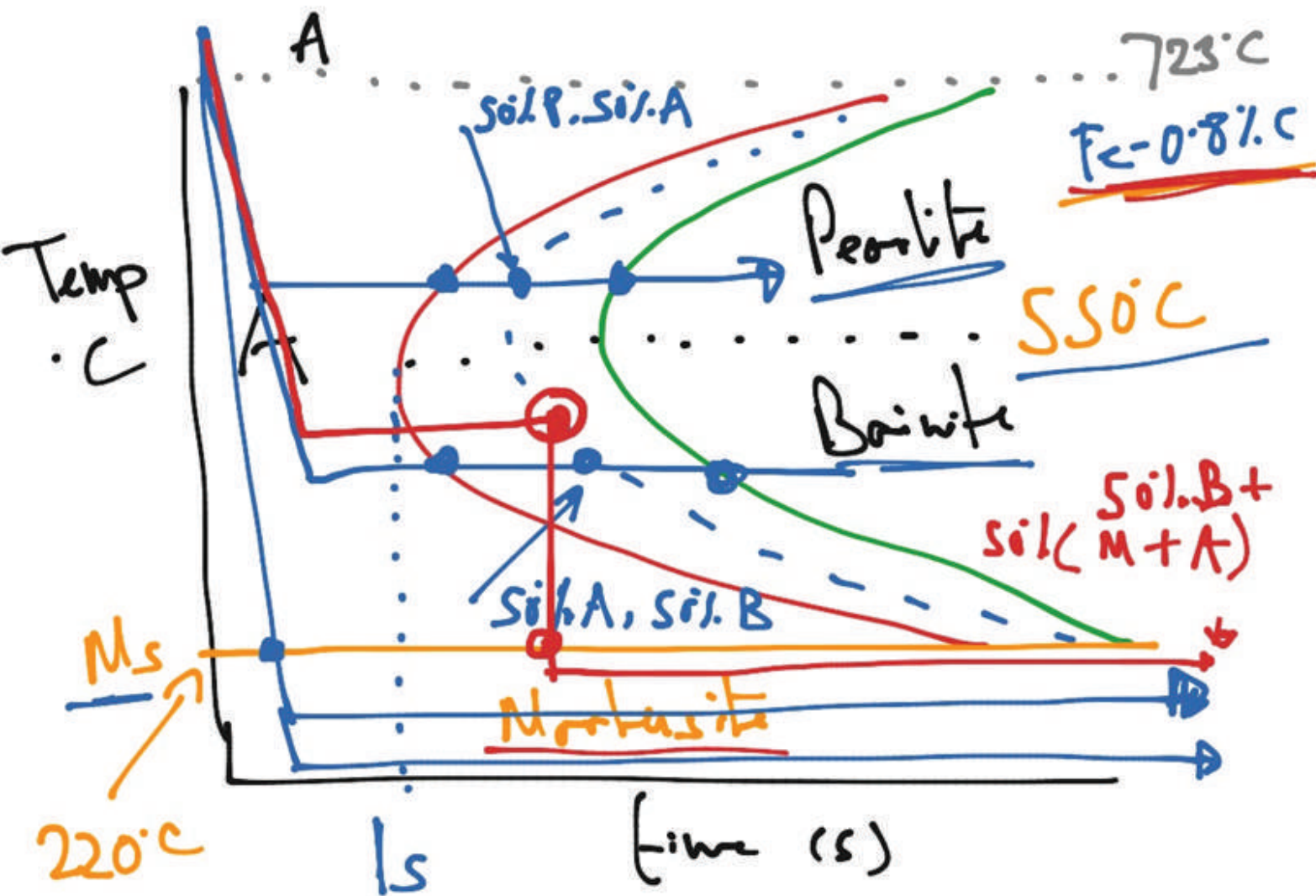
How it Delivers value and benefits to your business?

Implementing the principles of design and manufacturing is critical for achieving productivity, profitability, and meeting project schedules.

Mett-Bio's metallurgy consultants offer advice on design troubleshooting processes and metallurgical operations. Additionally, we provide expertise in metallurgical engineering to aid clients with design and manufacturing queries and solutions.

Our extensive consultancy services span from assisting in the selection of better materials to identifying loopholes leading to using lower-cost materials, all without compromising on performance, reliability, and overall efficiency.





ALLOY DESIGN

Alloy design is a knowledge-driven process aimed at developing novel metallurgical materials with specific compositional sensitivities. This process involves discovering new compositions and their associated properties and microstructures through systematic methodologies that pinpoint relevant metallurgical material groups. Ultimately, this approach helps in determining suitable compositions and microstructures for innovative alloy systems.

A secondary aspect of this process focuses on identifying key properties that impact design. This includes analyzing crucial parameters such as thermodynamic and kinetic factors, dislocation characteristics, interface properties, and phase transformation behaviours to ensure optimal performance and functionality.

LITIGATION SUPPORT

Our team of corrosion and metallurgy experts provides comprehensive support through specialized advice and expert witness testimonies. We also perform in-house testing to back up our assessments. In cases of product or component liability disputes, we offer litigation support by presenting validated metallurgical evidence and providing expert witness testimony in court.