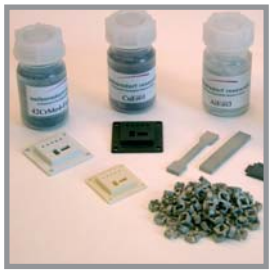


From powders to
complex parts – the PM way

MATERIALS RESEARCH
POWDER TECHNOLOGY AT ARC SEIBERSDORF RESEARCH

ARC Seibersdorf research GmbH is Austria's largest nonuniversity research company with a strong focus on materials technology. As part of the Materials Research division, the Powder Technology department develops powder metals, ceramic materials, and powder processes.

In particular, we offer our customers:

- Research and development for new and optimized PM materials
- Complete pilot-scale production processes from powders through to semifinished and finished products
- Prototype and small series production
- Feasibility studies

We conduct contract R&D, assuring our customers of strict confidentiality, and carry out publicly funded joint research projects. We also have a proven track record in assisting with applications for funding.

Our specific skills:

- Using our extensive PM expertise, mechanical and physical properties can be individually tailored to suit your requirements. Typical examples of the materials we work with include:
  - Iron and steels
  - Copper base alloys
  - Composite materials, such as metal-ceramic composites for metal-matrix components
  - Hard metals, hard materials, and cermets (WC-Co base, also in combination with TiC, TiN, etc.)
  - Refractory metals (Mo, W, etc.)
  - Oxide and nonoxide ceramics
  - High-performance ceramics for cutting materials
- Complete powder injection molding (PIM) production route available for prototypes and small series (all feed-stock types), including advanced R&D capabilities
- Wide range of materials characterization techniques

Our experimental facilities:

Powder preparation, mixing, and milling

- High-energy mixing and grinding aggregates (dry and wet preparation, special blends, dopants, etc.)
- Mechanical alloying

Pressing of powder and particle compacts and material composites

- Uniaxial cold and hot pressing
- Cold (CIP) and hot (HIP) isostatic pressing

Sintering and heat treatment

- Temperatures up to 2200 °C
- Atmospheres:
  - Vacuum (as low as 10^{-6} mbar) or inert gas
  - Oxidizing atmosphere
  - Reducing/carburizing atmosphere
  - Pure hydrogen or forming gas (N_2/H_2)

Pressure-assisted sintered samples

seibersdorf research

An Enterprise of the Austrian Research Centers.

Powder Technology at ARC Seibersdorf research

Hot pressing

is a process for sintering powder or simple components at high temperature under uniaxial pressure up to full density, usually under vacuum or protective gas. Backed by the competences of our materials characterization department, our hot pressing facility provides the basis for contractual and collaborative research with industry in the following fields:

- Iron and nonferrous metals (steel, special steels, nickel base alloys, titanium, copper base alloys, etc.)
- Hard materials and hard metals for demanding machining and forming operations
- Structural and functional ceramics (special ceramics, high-performance ceramics, other inorganic materials)
- Composite materials and material composites; combinations of high-performance materials
- Sputtering targets of complex composition

Hot press: *Max. pressure 100 tonnes, max. temperature 2200 °C, graphite hot zone, max. diameter 205 mm, variable thickness (typically 5–10 mm), max. load 5–7 pieces. Atmospheres: vacuum, protective inert gases, H_2 purge.*

Cold isostatic pressing (CIP) and hot isostatic pressing (HIP) facilities *are available at our partners in Bratislava 60 km from Seibersdorf.*

Sinter hipping

is a sintering process that facilitates sintering in the final stages of densification with gas pressures of up to 100 bar. It can advantageously be applied to liquid-phase sintering systems (hard metals, heavy metals, cermets, etc.).

Gas pressure furnace (sinter HIP): *Max. temperature 2200 °C, graphite hot zone, usable diameter 110 mm, max. height 180 mm. Atmospheres: vacuum, N_2 and Ar (both up to 100 bar over-pressure), H_2 under atmospheric pressure. Admixture of CH_4 etc. possible.*

High-vacuum furnace: *Max. temperature 1700 °C, molybdenum hot zone. Metallic shielding internally. Max. usable diameter 120 mm, max. height 350 mm. Atmospheres: vacuum 10^{-6} mbar, H_2 purge (atmospheric pressure).*

Powder injection molding (PIM)

is a process of 3D net-shaping similar to plastic injection molding. A blend of polymers and powders (feedstock) is injected into a die, molded, debound, and sintered to the required density. We can assist you in:

- Formulating feedstocks
- Supplying feedstocks in experimental quantities
- Developing injection molding, debinding, and sintering cycles
- Modeling and tool development (rapid tooling)
- PIM component prototyping and small series production

Catalytic debinding furnace: *Working temperature 120 °C, HNO_3 catalyst in N_2 atmosphere for CATAMOLD® feedstocks (BASF).*

Sigma blade compounder *for developing new feedstocks Batch size 750 cm³, temperature up to 280 °C, wear-resistant lining.*

Thermal debinding furnace: *Temperature up to 1000 °C (vacuum, reducing, oxidizing, and inert atmospheres), muffle size 30 liters, binder trap, burn-off stack.*

Injection molding machines: *Clamp force 40 and 50 tonnes, adapted for PIM materials.*

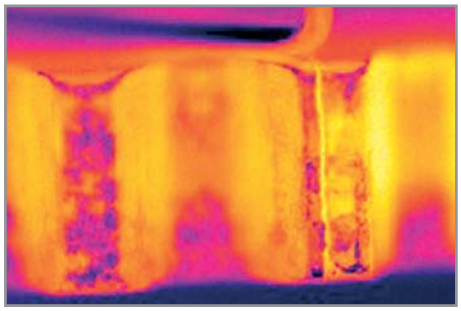
For further information, please
mail or fax the following form to Dr. Georg Korb.

Fax: +43(0) 50550 – 3366

- ❑ I would like to receive more detailed information.
- ❑ I would like to attend an information event about PM in Seibersdorf (planned for December 2004).
- ❑ I would be interested in visiting Seibersdorf's PM facilities.
- ❑ I would be interested in receiving a company visit from a Seibersdorf PM specialist.
- ❑ Other comments:

Characterization and test facilities for PM materials:

- Entire range of mechanical properties up to 1000 °C
- SEM, TEM, optical microscopy
- Thermophysical properties (thermal conductivity, CTE measurements, specific heat) from –100 °C to 1600 °C
- Friction and wear testing from –100 °C to 300 °C
- A wide variety of other properties under extreme environmental conditions, e.g. space conditions
- Nondestructive testing using thermal imaging, e.g. online detection of cracks and pores in green parts



Nondestructive detection of cracks using thermography

Contact

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To
ARC Seibersdorf research GmbH
Materials Research
Dr. Georg Korb

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