

Competence in ceramics

MicroCeram GmbH in Meißen near Dresden acts very successfully as a **flexible service provider** in the growth market of **technical ceramics** such as aluminium oxide and zirconium oxide and within this market with an impressive range from **prototyping to serial production**. Thus the ceramic **application oriented material research** and design is part of their business activities as well as rapid prototyping, injection molding with low-pressure method for small and middle batch sizes and with high-pressure method for efficient high production volumes. The process chain is completed with all relevant chip-removing methods in soft and hard materials – including the future oriented **ULTRASONIC technology** from DMG, a technology with advantages for not only ceramics but also for all other **“advanced materials”** at MicroCeram.

MATERIAL RESEARCH

3D-CAD/CAM // PROTOTYPING

LOW PRESSURE INJECTION MOLDING

HIGH PRESSURE INJECTION MOLDING

CNC - HARD MATERIAL MACHINING

CNC – SOFT MATERIAL MACHINING

QUALITY MANAGEMENT



Competence in ceramics

If you want to act successfully and most effectively in the future market of technical ceramics, you should be able to handle 4 basic features: First the configuration of the correct material, second the transfer of this know-how into a ceramic oriented construction, third the fast production of a prototype and last the ability to produce the new part in a flexible, process-secure way and under market competitive conditions in differing batch sizes.

Valve housing of aluminum oxide for the **chemical industry**...



... Advantages of ceramics are here the temperature resistance and acid resistance

Based on this background the MicroCeramics GmbH, with their 40 employees and an annual growth of double-digit percentages, belongs not only to the most successful companies on the market, but to those companies, who can look into the future with high self-confidence and optimism.

Especially as the Meißener company focuses on a market segment, in which only a few service providers act. "We are not doing, what everyone else is able to do, but we concentrate on these sectors of technical ceramics, which not everybody can handle and not everybody is willing to learn overnight," Mathis Wilde, managing directors at MicroCeram is pointing out. Wilde explains: "Our main capacities are highly complicated work pieces with special filigree and highest precision geometrical characteristics."

So is it more Know-How than workshop experience? "By no means", Roland Schreiber, the second managing director replies. Only the sum of all the experience within the company results in one total. Not for nothing the Meißener company characterizes itself as a competent service provider, who is active in the complete production chain of technical ceramics like aluminum or zirconium

oxide and within this sector with a broad range from prototyping to serial production. Thus the application oriented material research and ceramics oriented construction is part of the business activities as well as the pressing of so called "green bodies" as raw parts for rapid prototyping and the smallest of batch sizes and also for small and medium batches and in high pressure procedures for the efficient production of large batches. The process chain is completed with all relevant methods for chip removing soft and hard material machining.

Based on this extreme depth of added value the company acts as a problem solver in a large number of different sectors like the general machine building, the chemical sector or the electronics sector. Additionally the micro systems sector, the dental sector (due to the biological compatibility of ceramics) and the medical sector especially will become new and main company areas.

In the beginning there was a corn...

One of MicroCeram's main capabilities is the experience of decades in technical ceramics and therefore their extreme expertise in choosing the right material

and its composition. As a result of this a successful project is based on – underlines Roland Schreiber, with explaining: "Ceramics is not like Ceramics, but the material can be configured directly by the composition of the raw materials with their different and partially conflicting characteristics and criteria. Thus it is possible, to influence all factors of the final ceramics directly within the limits of physics. Beginning from the density of the material and its hardness, its consistency and solidness, its elasticity to the factors of temperature conductivity, bending stability, linear extension, consistency against temperature i.e. temperature cycling, chemical and electrical resistance."

Because they know, what they are doing...

Thereby the composition of the basic powder is a (secret) 'business asset'. Particularly as the decision of the correct raw material composition is covered by the requirement of a final shape forming as best as possible. This target is phrased by his manager colleague Mathis Wilde as follows: "All material, which is not there, saves time and cost afterwards" and he explains the detail: "The degree of shrinking can be between 10 and 30 percent depending on the material. In this process it counts the less polymer binder is added, the less is the vibration. And the less the vibration, the higher is the work piece accuracy after the previous confinement and sintering process."

Roland Schreiber demonstrates the possibilities with an example of a thread production. "Today we are in a position that we can calculate the fading in the area of the edge, the core diameter and the draft so exactly that we can produce inside threads with an accuracy of M1,6 to for example M20 without any problems." This is more easy to read than to do, Martin Wilde explains in detail: "To find the correct rate (in the truest sense of the word) here, is a big challenge, which is getting more bigger, the smaller and the more complicated the parts and the more fine the geometric elements are, which have to be integrated."

Subsequently Roland Schreiber points out a further aspect of ceramic construction: Besides all other factors the specific characteristics of the material have to be respected. For example sharp edges have

The **dental sector** is one of MicroCeram's biggest hopes for the future. At the moment the first tests start, to be on the ball, when the dynamic of growth in this sector lifts off. The main advantage is the biological compatibility of the material, thus the risk of allergic reactions can be eliminated completely.

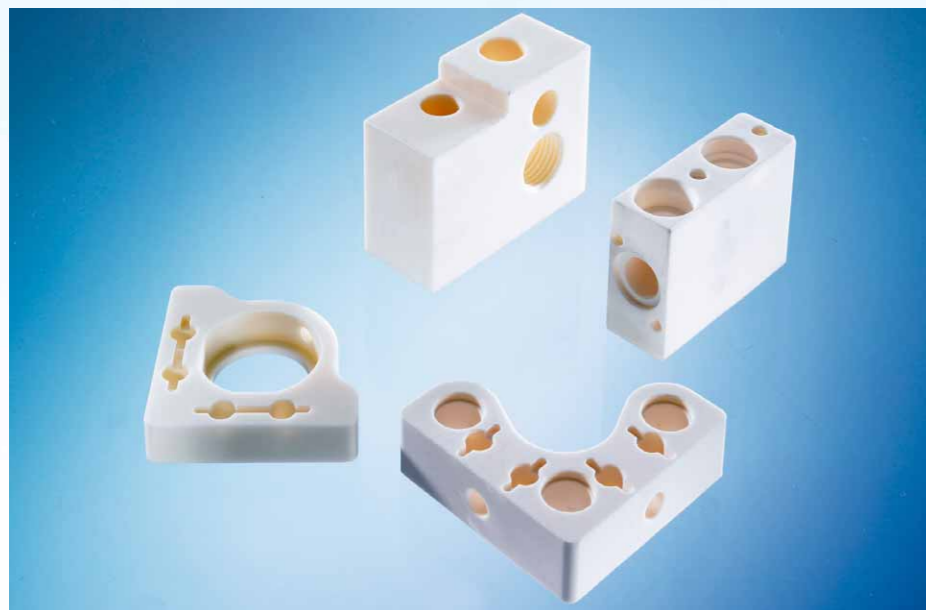


The **medical market** for ceramics in general and for MicroCeram especially belongs to the highest growing sector. MicroCeram's high ambitions in this sector are proofed not least in the quality management DIN ISO 13485, for which the certificate will be applied soon.



Further examples for the various use of ceramic components are in the **medical technology**: here especially parts for endoscopic (microinvasive) devices, micro scalpels and special canula.





to be avoided as well as high contour transitions and extreme changes in the wall thickness. But in comparison to the fading prognosis this problem is only a little one, Schreiber values humbly.

The "green body" is the one!

Is the construction perfect, the prototyping and the pre-serial production start. For this step the so called "green bodies" are pressed as raw parts for the subsequent soft machining. Theoretically the fitting tool could be built also. But apart from the costs, this injection molded tool with all its features would last about 4 weeks for production. "In this time, and even faster, our customer gets the finished prototype in original material in serial quality, on which can perform tests and optimizations, before the serial production starts," Mathias Wilde explains.

This in turn are dimensions in time, which have a strategic dimension, as Roland Schreiber points out. "With a complete machining of the "green bodies" we are in a position, to react on request within a few weeks and with low costs, which reduces the risks in time and money when shifting to ceramics and raises the willingness of potential customers even to deal with ceramics in the same degree." And with a convinced customer, all wishes in the following process chain can be fulfilled by MicroCeramics.

Competence in all batch sizes

One additional main competence and an important distinguishing feature of the company is in the sector of low pressure injection casting with subsequent hydraulic compression, which has been establis-



Also one successful part of the company's achievement for ceramic parts are used for the growing **laser technology** market. Here especially you have to point out the advantages in thermal isolation and electrical resistance.

hed as a first class choice at MicroCeramics for batches between 100 up to 10.000 pieces.

Proudly Roland Schreiber points out the advantages of this highlight: "In contrast to the 'normal' high pressure injection cast, in which the material is injected in the form with a pressure of over 1.000 bar, we use injections of 6 to 20 bar. Therefore the forces in the tool are much lower, which allows simpler and cheaper tools, the machine dimensions can be smaller and the process costs in total can be reduced dramatically.

"Additionally due to the minor forces in the tools it is possible to produce high complicated working pieces with thinner walls and more filigree details", Roland Schreiber explains and adds: "Furthermore when looking on the growth market for micro system technology, we are able to produce even smallest parts in a range of only a few millimeters with extreme accuracy. All in all we push the limits concerning the complexity and material dimensions in comparison to the high pressure injection cast." And this is also possible for large batches bigger than 10.000 pieces at MicroCeramics, as well as the complete spectrum for soft and hard material machining.

Here three examples of ceramic parts, as used in the **vacuum technology**. The main advantages the customer's point out are that no gases from the material occur and the relative process is not influenced (for example in coating systems).



The concave cone is the prime example of MicroCeram's expertise in the **low pressure technology**. Together with the other parts the cone belongs to the sensor systems, in which ceramics reduced the endurance in comparison to plastic alternatives in a revolutionary way.



These are work pieces, which can not be identified by a metal worker at first sight, but yet should be familiar. Due to their high temperature stability and electrical isolation these ceramic parts belong to the **injector technology** of plasma welding and cutting systems.



Within their total strategy for growth MicroCeram more and more uses the advantages of the **ULTRASONIC technology**. In detail the company is impressed of the low process forces during the hard material machining with a high level of productivity, flexibility and process stability at the same time.

ULTRASONIC from DMG optimizes the process chain

In the context of her integral strategy for growth MicroCeram more and more focuses on the future orientated ULTRASONIC technology from DMG. MicroCeram is most impressed of the little process forces during hard material machining – with a high level of productivity, flexibility and process stability at the same time. Not for nothing the two recently installed ULTRASONIC 35 machines will be completed by one additional 5-axis machine with tool changer of the new ULTRASONIC 20 linear machine type. With this machine MicroCeram opens the market of an economical complete machining with Ultrasonic technology, which heralds a new era in flexibility and efficiency for the company. “And not only in the ceramic sector”, Mathis Wilde underlines and points out the company’s service ambitions in the sector of technical and optical glass like quartz crystal glass like zerodur or other “advanced materials”.

The fact that MicroCeram with her more than 40 machines copes with all other possible methods, which are necessary for a overall process chain for machining technical ceramics beyond the ULTRASONIC technology, it nearly goes without saying in regards to the described claim of competence of the company.

The equipment consists of several CNC controlled cylindrical and flat grinding machines, high resolution micromachining centres, 5-axis precision machines as well as a various number of lapping, polishing and honing machines for the finishing of parts. And even laser technology with different power classes and wave- and pulse length for laser ablation or structuring of work pieces has already made its way into MicroCeram’s machinery.

Trust is good...

Also with there quality management MicroCeram satisfies the highest demands. As a proof of evidence Roland Schreiber refers to the DIN 9001:2000 certificate for the complete process from

research to the fabrication and machining of ceramic parts. There the company’s internal laboratories are able to do all relevant process control methods of analyzing. For the control of measurements, form and length tolerances high precise measuring systems are on permanent stand-by. By the way and finally: as the next strategic milestone MicroCeram looks after the certification for the quality management system for medical products DIN ISO 13485, as for this highly sensitive sector trust is good, but a certified control is even better.



Both managing directors Roland Schreiber (left) and Mathias Wilde have created a company with their high expertise and experience, which complete competence does not have to fear any competitor on the ceramic sector.





Competence in ceramics



LASER- AND SENSOR TECHNOLOGY

Good electrical breakdown firmness and a resistance over the complete pH-range are the advantages of ceramic materials on the sensor- and laser technology.

MEDICAL AND DENTAL TECHNOLOGY

In the medical technology ceramic materials prove their biological compatibility. Ceramics also are resistant to body fluids.

ANALYSIS TECHNOLOGY

Excellent resistance against high temperatures and resistance against aggressive medias are advantages of ceramics.

INJECTOR TECHNOLOGY

In the injector technology ceramics play a main role due to their excellent characteristic in regards to wear, density, durability and thermal resistance.

VACUUM TECHNOLOGY / PHOTOVOLTAIC

The thermal resistance as well as their abrasion- and corrosion resistance of technical ceramics predestinate these materials for the use in the vacuum technology and also in the photovoltaic sector.

