OXIDKERAMIK J. Cardenas – 50 Years of Quality in Technical Ceramics

The company founded in 1966 by chemical engineer Jorge Cardenas and Elly Cardenas in Albershausen, Baden-Württemberg, Germany, has been dedicated to the fascination of ceramics for 50 years.

The family company that is now managed in the second generation by brother and sister Stephan Cardenas and Danielle Cardenas started off with the manufacture of slide rings made of alumina ceramic for the mechanical seal industry, which thanks to the technical advantages and the high-quality finish of the products soon led to company becoming well established.

In 1970, the company was able to move into its own premises in Albershausen. With the continuous expansion involving a host of building phases and their extensions, the production and administration area today covers 2400 m^2. Stephan Cardenas, a graduate in materials engineering, has been in charge of technical management and product development since 1995.

Over the years, the product range has been widened significantly with the addition of other materials and reproduction of their applications. The most important applications for the manufactured components, including high-temperature applications, are: machine and plant engineering, the pump industry, plant engineering for the production of pharmaceuticals and foodstuffs, the chemicals segment, electrical engineering as well as power and environmental engineering.

Four materials are produced in Albershausen:

- OK997: high-purity alumina ceramic with 99,7 % Al_2O_3 (C799)
- CR101 and CR105: two zircon oxide ceramics, the first ZrO_2 partially stabilized with MgO; the second ZrO_2 partially stabilized with Y_2O_3
- CARSIC310: direct-sintered silicon carbide (SSiC).

Keywords
alumina, zirconia, silicon carbide

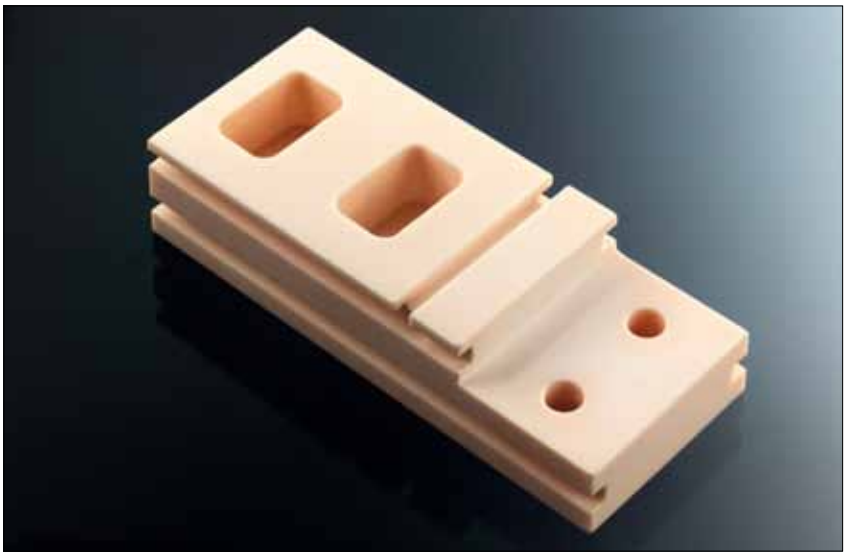

Fig. 1
Angular isolation component

The material OK997 with a specific density of 3,9 g/cm^3 boasts very high hardness (2000 HV 0,5) and dimensional stability, high wear resistance and compressive strength as well as temperature resistance (to 1500 °C) and guarantees high dielectric strength (>20 kV/mm).

On account of a high specific contact resistance (5×10^{14} Ω/cm), the material is electrically insulating and exhibits dielectric behaviour, its thermal conductivity (28 W/m·K) is especially good. The company manufactures components made of OK997 with high compressive strength (2000 MPa) to a diameter of 450 mm. Plates and bars made of technical ceramics are also possible.

The applications of these components are varied, worth mentioning are chemicals, electrical engineering and the pump industry and, because of the possibility of SIP/CIP cleaning, the pharmaceuticals and foodstuffs industry.

The high-performance ceramics CR105 and CR101 impress with their exceptional fracture toughness (8 MPa·$m^{1/2}$ for CR101 and 10,0 MPa·$m^{1/2}$ for CR105) and bending strength (560 MPa for CR101 and 1000 MPa for CR105). In addition come the traditional ceramic properties such as corrosion resistance, wear resistance and hardness. Depending on the design, the company can manufacture products made of zircon oxide with a diameter to Ø 400 mm in line with customer requirements. Individual machine elements and components with specific requirements, which guarantee very long service lifetimes, like, for example, cutting

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Fig. 2
Dosing unit as demonstration model

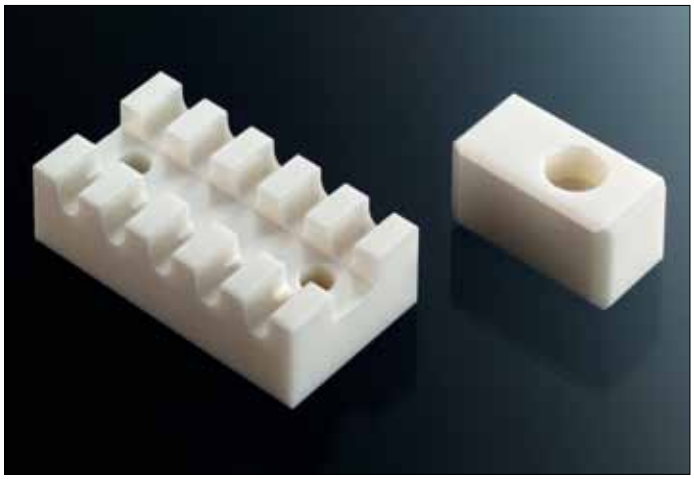

Fig. 3
CR105 thermal insulating component

blades and tips, slide bearings and sealing rings, insulating rings and protective tubes, flue gas dampers and valves, are made from these ZrO_2 materials.

The gas-tight material CARSIC310 (porosity 0 %) with a specific density of 3,1 g/cm^3 features extremely high hardness (2400 HV 0,5), high temperature resistance (up to 1500 °C) as well as very high thermal conductivity (100 W/m·K) and has chemical resistance over the entire pH value scale (0–14). In addition, the material exhibits its excellent tribological behaviour (good emergency and dry-running properties). Especially the high hardness, the high wear resistance, low density and high-temperature strength characterize this material, setting it apart from metals. In addition, compared to metals, CARSIC engineering ceramics are especially corrosion- and wear-resistant.

For components made of this material, thanks to the specific technical properties, depending on design, sizes to Ø 200 mm are possible with extremely high compressive strength (2400 MPa). Peripheral speeds up to v = 50 m/s are no problem for products made of CARSIC310. CARSIC310 is used primarily for making sliding bearings, sliding rings and bearing bushings for the chemicals and pump industry.

With the material CARSI310, OXIDKERAMIK J. Cardenas also offers metal-ceramic composite solutions, the outstanding properties of silicon carbide being combined with the advantages of assembly-friendly metal. In the design of these components, attention is paid to a low-gap design to meet the highest hygiene standards.

For shaping and green machining, the company has a range of equipment that enables a very close-contour fabrication from the start. Also for subsequent hard machining, the company is well-equipped for precision fabrication of a wide range of designs. The company's employees can look back on many years of experience in ceramics fabrication and machining. Checking and testing of important functional dimensions and tolerances are performed in compliance with the latest quality standards.

The company maintains close contact with external institutes where materials and components are regularly tested. In connection with ISO certification 9001:2008, the developed materials are also tested. OXIDKERAMIK J. Cardenas GmbH is also DEKRA-certified in compliance with DIN EN ISO 9001. The ceramic products can be permanently marked, enabling their traceability.

Thanks to the manufacturing structure and flat hierarchies, the company can respond very flexibly and quickly to customer requests. True to the motto "Technical ceramics – opportunities and solutions connect us", the Albershausen-based company has specialized in supporting customers with regard to material issues and ceramic-compatible design. Every customer requirement is realized individually. Every customer receives

Fig. 4
SiC shaft with SiC bearing

the necessary solution in line with the specific technical specifications with regard to material selection and ceramic-compatible design. And therefore, for the correct choice of ready-to-install ceramic components for his application. Materials and products are optimised in continuous enhancement processes, together with the customer, ever new application and combination possibilities for ceramic components are developed.

High-precision ceramic components can be fabricated as prototypes but also manufactured in small and large series. As a one-stop producer, beginning from the raw material to the finished product, the company is able to manufacture large series very economically.

High-precision designs and tolerances with excellent surface finish guarantee optimum performance of the components. In light of the increasing technical possibilities, the company's strategy is heading in the direction of high-precision ceramic components. The company is managed with sustained interest, with the intention to grow steadily but also with careful consideration. Saving resources and energy are important topics. The employees are considered the biggest asset as they enable customer orientation as well as fast and reliable delivery times. Apprenticeships are offered regularly.

How important people are to the company family is shown by the high social commitment. Stephan Cardenas is the initiator of the football project "Football with and without a handicap – ON TOUR", which has already been presented with several awards on state level. In this project, which was started five years ago, events are arranged in which children with and without disabilities play football together and with each other.

Fig. 5
SiC bearing for a pump used in the chemical industry

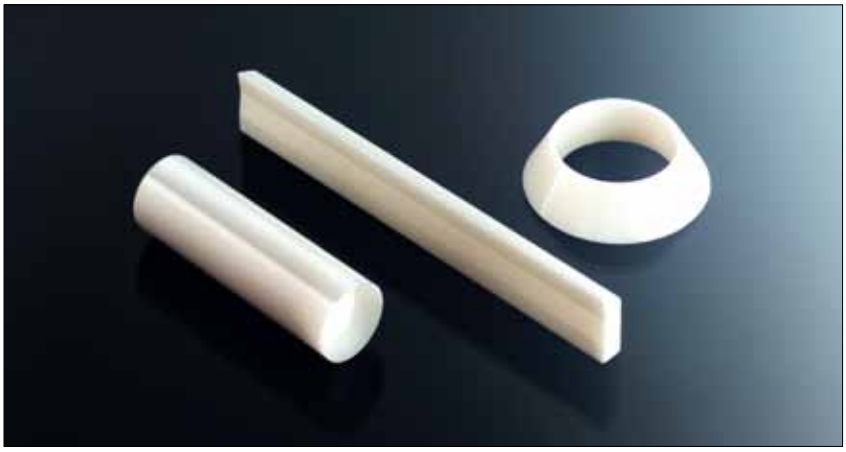

Fig. 6
CR105 cutting ceramics

Maximum precision is a guarantee for the high quality of the company's technical ceramic products. The comprehensive material know-how coupled with extensive experience in fabrication amassed in the 50-year history make OXIDKERAMIK J. Cardenas GmbH, today a leading company in the development and fabrication of technical ceramics, a strong partner at its customers' side. MM