

# Ceramic Components for Pumps and Valves from Rauschert

Technical ceramics are good solution for demanding pump and valve applications where conventional materials fail. Related to the individual application the choice of material, shape and surface finish has to be defined to meet demanding requirements.



Fig. 1  
Ceramic pump components

## Keywords

ceramic coatings, ceramic valves, ceramic pump components, alumina, silicon carbide, silicon nitride

## Introduction

Technical ceramics are good solution for demanding pump and valve applications where conventional materials fail. Aluminium oxide (also known as alumina  $Al_2O_3$ ) is a relatively low cost ceramic material, with high hardness, wear resistance, corrosion-

resistance against acids and caustic solutions and thermal conductivity; the combination of these attributes make it ideal for many pump and valve components. Ceramic components can be formed into a variety of complex shapes by dry pressing, injection moulding, extruding or isostatic pressing; the forming methodology depends on the component size and shape, as well as the number of parts required. Tight dimensional tolerances and flatness can be achieved by diamond machining the sintered part.

## Ceramic pump components

Rauschert ceramic pump components are used in heating, dosing and high pressure pumps used in industrial, chemical, food and landscaping applications [1].

Alumina is the most commonly used ceramic material for pump components due to its low cost; however more expensive silicon carbide (SiC) and silicon nitride ( $Si_3N_4$ ) are used when their properties are required. Silicon carbide has higher thermal conductivity, and so is used for applications that require a high thermal shock resistance. Silicon nitride has high thermal shock resistance, impact strength and fracture toughness making it ideal for applications with mechanical stress by centrifugal forces or strokes [2].

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Fig. 2  
Plumbing fittings



Fig. 3  
Ceramic gaskets



Fig. 4  
Ceramic coatings

Examples of Rauschert alumina pump components include

- Sliding and bearing rings, produced by dry pressing, where the high hardness results in a significant increasing in component life compared to equivalent steel parts. The parts are ground after sintering and polished if required.
- Shafts, axes and plungers, produced by isostatic pressing from brown alumina, used for good tribological properties. This forming technology avoids a press-neutral zone inside the ceramic component. Hard machining (grinding and polishing) provides a uniform surface structure over the length of the component. The high wear resistance of the material keeps the leakage low through long operation time. But here, also white alumina is requested more and more.

Rauschert uses various aluminas with purities from 95 to 99,7 % depending on the customer application and requirements. These materials comply with different drinking water regulations including cer-

tification for use up to 85 °C for KTW for Germany and WRAS for United Kingdom. We also support our customers' application for certification such as ACS for France, NSF for food safety.

Rauschert helps our customers by providing prototypes, made by a special rapid manufacturing procedure. In this way, our customers can test these prototypes before deciding on series production for new products.

#### Ceramic valve components

Ceramic valve components from Rauschert are used for industrial mixing plates including plumbing fittings and pneumatic valves used in industrial, medical and commercial applications. Rauschert manufactures ceramic gaskets by dry pressing, similar to the axial bearing seals. These gaskets control and regulate corrosive fluids in fittings and abrasive gas flows in pneumatic valves. The change to technical ceramics for this application increased the reliability and lowered the costs for service and repairs.

Components used in valve systems must also be able to withstand heavy wear, high temperature and high pressure; ceramics are able to outperform metals and plastics in these applications. Ceramic gaskets by Rauschert, manufactured for a precise fit, ground and polished, are ideal for valves and plumbing fittings. They guarantee constant flow control and an optimum sealing function [1].

#### Ceramic coatings

Ceramic coatings from Rauschert offer a longer-life alternative to steel components, with a lower overall costs than ceramic components. High wear parts of a steel component, such as a plunger can be coated with a ceramic layer of alumina or titanium oxide (TiO<sub>2</sub>) by either thermal spraying or an electrochemical procedure (nano-ceramic coating) [1]. The finished component has the wear resistance where it is required at a lower overall cost as well as electrical and thermal insulation.

#### References:

[1] Rauschert GmbH, [www.rauschert.com/en/products/technical-ceramics](http://www.rauschert.com/en/products/technical-ceramics)

[2] Möller, F (Rauschert GmbH): Hart im Nehmen. Use of technical ceramics for hardly strained applications.