

Perfect Pore Depth for Various Applications

For most of the ceramic manufacturers, a pore is a flaw that has to be avoided. Very few of them can incorporate pores with predefined properties in ceramic materials. CeramTec has taken this step to the market: The Chemical Applications Division produces ceramic products with variable porosity and pore sizes for versatile applications. Each material offers a unique set of advantages that pays off in the respective application.



Fig. 1
Alutit components for aluminium casting

Ceramic products made by CeramTec are used in industries. Decisive are the material properties, which have already proven themselves in the markets such as energy, environment, mechanical engineering and medical technology.

A property which is usually undesired in ceramic is the formation of pores. However

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the presence of pores has opened many new application fields for high performance ceramics, which are covered by CeramTec's respective materials. Partially these materials are developed with a very joint and close cooperation with the customer.

Gas analyzing

Amongst other applications, porous ceramic products from CeramTec can be used in gas analytics. Especially for this application,

analysts have used zirconium silicate crucibles, with 30–50 μm pores permitting the gas to pass through. The solids are brought into the crucible and heated. The gases resulted by the combustion pass through the system of pores for analysis. The pore structure is designed in a manner that enough combustion gases are still able to pass through with low pressure loss while retaining the solids – even if a vessel is half full with combustion residues.

Shaped glass

Variable shaping is often necessary in the glass industry for producing tailor made products. Advanced ceramic products from CeramTec can be integrated into the production process for these types of glasses. Chromium aluminium silicate with very fine pores in micrometer diameter range is the most suitable material for this application, because the glass does not adhere to the ceramic due to its special material composition. The system of pores makes it possible to press the hot, still malleable glass onto the mold using vacuum pressure to give the glass the desired shape. These glass shapes are used for making spectacles. The shaping tech-

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nique and this particular material bring the advantage of manufacturing variable geometries.

Proven resistance in electroplating

Another variance of porous ceramics material is the 80 % alumina, used in chrome plating. Due to its excellent chemical resistance it can withstand even aggressive chromic-sulfuric acid. As sulphuric acid is used in electroplating, plant operators need a resistant ceramic that must allow chromium ions to pass through. Metallic impurities can be prevented with the aid of such a permeable medium. The 80 % alumina ideally meets these requirements with a porosity of 30 % and characteristic pores of $0,4 \mu\text{m}$.

Besides that the components are also suitable for tensiometer cells for measuring soil moisture levels.

Catalysts for the oxidation process

Even 99 % pure alumina can be used as a porous ceramic in chemical engineering. The porosity is fundamental since it is used as a catalyst carrier. The porosity varies between 30 and 65 % depending on the application. The catalyst carriers used for oxidation processes can be shaped to different geometries. The catalytically active precious metals are deposited in approximately $5 \mu\text{m}$ pores. These catalyst carriers are used in the chemical industry for the industrial-scale production of basic chemicals.

Porous ceramics in the foundry industry

The properties of aluminium titanate (ATI, Alutit, Al_2TiO_5) pay off clear advantages in another application: This ceramic has pore diameters smaller than $0,4 \mu\text{m}$ and is used in the foundry industry, especially for the aluminium die casting. Non-wettability of molten metal characterizes the aluminium titanate material. Aluminium titanate withstands even the most extreme conditions in molten metals. Aluminium titanate effortlessly masters challenging conditions such as aggressive melting, maximum temperatures of $900 \text{ }^\circ\text{C}$ and thermal shocks of several hundred degrees. This extraordinary thermal shock resistance is a result of the very low thermal expansion and a porosity of 12 %. Its low thermal conductivity saves energy whereas outstanding chemical and



Fig. 2
Porous ceramics for the glass conversion technology



Fig. 3
Catalyst carriers for the production of chemicals



Fig. 4 a–b
Porous ceramics proves value in galvanics



abrasive resistance ensures high melt purity. Alutit casting nozzles and riser tubes are used to make large engine blocks, chassis

parts and rims. The maximum length of CeramTec Alutit tubes is 2 m and the maximum diameter is 40 cm.