SCHOTT NEXTREMA® – a New Glass-Ceramic Material Platform Combining the Benefits of Glass and High Temperature Materials

SCHOTT NEXTREMA® glass-ceramic refers to a material platform that consists of six different versions of glass-ceramics that differ not only in terms of their colour impression, but also their technical characteristics. In addition, they come in a broad range of material thicknesses of between 2 – 8 mm. The combination of these characteristics will enable new product designs and innovations such as infrared heaters, high-temperature furnaces, barbecue grills, and electronic devices, for example, in the future. With its portfolio of glass-ceramics, SCHOTT/DE offers an extremely large variety with respect to this class of materials.

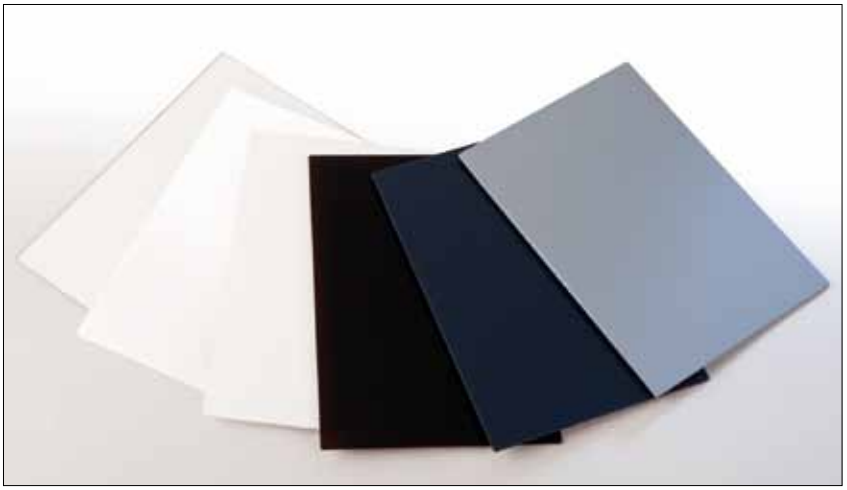

Fig. 1
The SCHOTT NEXTREMA® glass-ceramic material platform consists of six different versions of glass-ceramics that differ in terms of their colour impression as well as their technical characteristics (Photo: SCHOTT)

Introduction

SCHOTT NEXTREMA® glass-ceramic is an innovative material that is characterized primarily by its many different areas of application. It appeals to designers as well as engineers because it allows new designs and functionalities in the area of product development.

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NEXTREMA® glass-ceramic combines the advantages of technical glasses (high transmission, resistant, non-porous surfaces, and the possibility of producing large plate formats cost-effectively) that are well-known in the industry with outstanding thermal properties that are usually found only in other special materials such as ceramics or quartz glass. The sum of the technical features together with the six colours enables engineers and designers alike to develop new product ideas.

Thanks to specially developed ceramization programs, the following material benefits can be generated that make up this versatile material:

Keywords
glass-ceramics, high-temperature application, design solutions

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Fig. 2
NEXTREMA® glass-ceramic can be processed in many different ways (Photo: SCHOTT)

Fig. 3
Extra-thin NEXTREMA® glass-ceramic is well-suited for optimised infrared transmission. This opens up new applications for energy-efficient heating processes, such as heating exterior and interior areas (Photo: www.heatscope.com)

- A smooth, non-porous surface
- Excellent thermal resistance of up to 950 °C
- Four times higher resistance to thermal shocks of up to Δ 820 °C compared to other technical glasses due to its nearly zero thermal expansion
- Very high transmission in the infrared range in connection with various transmission factors in the visible range ensures maximum heat performance while significantly reducing the visible light portion
- The chemical resistance is similar to the types of glass used in laboratories and allows for it to be used in aggressive, corrosive process atmospheres.
- The natural mechanical strength without prestressing saves additional curing steps
- It is possible to produce large near-net-shape plate formats in various material thicknesses
- Six attractive, natural colours without any additional decoration.

The combination of these characteristics will enable new product designs and innovations in the future. This is illustrated by the following examples.

Opening up new fields of application for infrared radiators

The manufacturing process for the special NEXTREMA® glass-ceramic in the extra-thin material thickness of 2 mm was developed especially for optimised infrared transmission. In connection with short- and medium-wave infrared heating elements in the range of 800 – 5000 nm, this opens up new applications for energy-efficient heating processes, for heating exterior and in-

Fig. 4
In conjunction with transparent thin-film heating coatings, NEXTREMA® glass-ceramics enable innovative designs for household appliances, such as this elegant toaster of the Morphy Richards Redefine Collection (Photo: SCHOTT)

Fig. 5
The high resistance of NEXTREMA® glass-ceramic against thermal shock in connection with the possibility of 3D-forming opens up new possibilities for designing barbecue grills (Photo: SCHOTT)

terior areas, for example. Here, the bright visible light portion of the heating elements is drastically reduced with very good heat output. The availability of large format infrared-transparent panels will allow for process innovations in the industrial sector as well. Here, the thermal and mechanical properties ensure that the risk of material failure due to thermal shocks, for instance, is reduced to a minimum in normal use.

Revolutionary designs in the area of grilling/cooking

The high resistance of NEXTREMA® glass-ceramic against thermal shock in connection with the possibility of 3D-forming opens up new possibilities for designing barbecue grills. When used as a cover, the transparent material type allows you to key an eye on grilling and cooking processes when the cover is on. This leads to more energy-efficient grilling and better grill results. Heat-induced glass breakage is not an issue either due to the extremely high thermal shock resistance of up to Δ 820 °C. In conjunction with the transparent thin-film heating coatings, innovative designs can be realized for household appliances, such as transparent toasters or irons.

Larger, more productive machines for high-temperature furnaces in cleanroom processes

The opaque material versions of NEXTREMA® glass-ceramic ensure a particle-free process atmosphere and excellent thermal insulation in the thermal processes used to manufacture displays. Especially the large plate sizes have made it possible to design ever larger and thus more efficient process ovens and replace materials such as quartz glass, which can only be produced in the respective plate formats with great effort.

Simple value chains for attractive glass designs, the panels of high-quality electrical and household appliances, for example

NEXTREMA® glass-ceramic can save the process steps of prestressing, material colouring/decoration necessary with normal glasses through its natural coloration and intrinsic mechanical strength and thus reduces the complexity of value chains for innovative design concepts. The fact that 3D formed parts can be produced leads to new designs.

More degrees of freedom in how glass-ceramic can be used as a material due to the broad variety of material thicknesses

SCHOTT has optimised the manufacturing process for NEXTREMA® glass-ceramic in such a way that it is now also possible to produce material thicknesses that exceed 8 mm and are thinner than 2 mm with the help of a conventional manufacturing process. This opens up new possibilities for surface structuring of thicker materials. If substrates thinner than 2 mm are needed, time- and cost-intensive process steps such as polishing can be avoided or shortened due to the extra-thin starting materials.