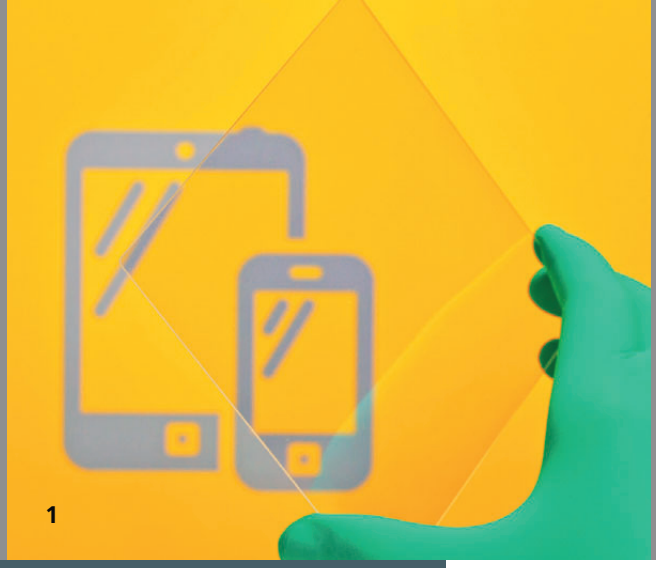

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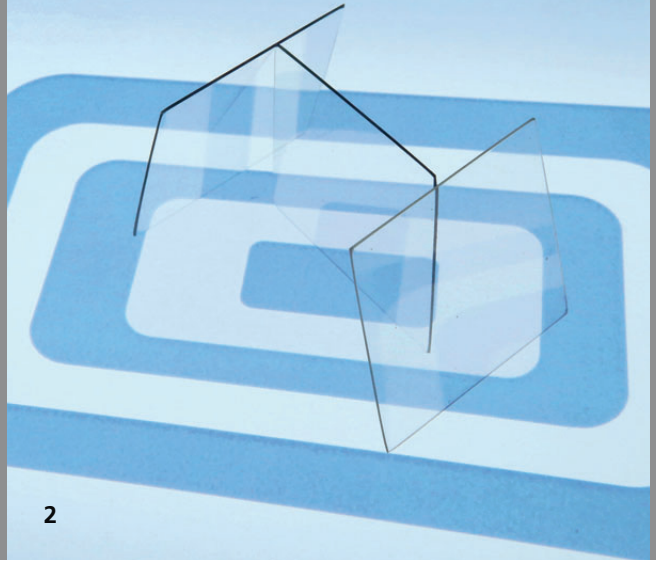

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# ULTRA-THIN TRANSPARENT CERAMICS FOR SCRATCH-RESISTANT DISPLAY COVERS

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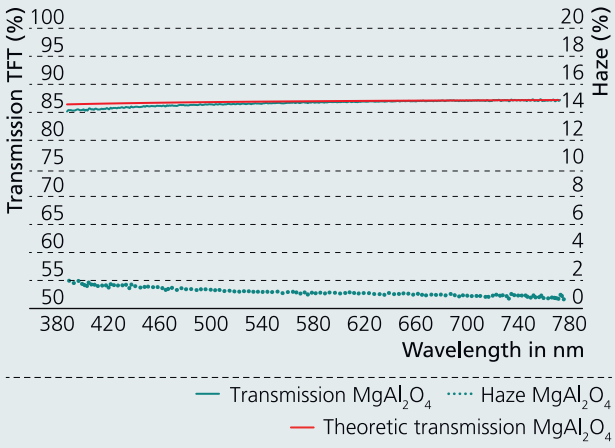
Whether for industrial applications, medical technology devices, household equipment or in the leisure sector, modern communications technology relies on electronic display and contact elements. Built-in displays with touch-functionality are subject to great mechanical stress not only in industrial environments, but also in every-day consumer applications. Therefore, suitable cover materials should be not just particularly thin but also offer a combination of high optical transparency, scratch resistance and mechanical stability. Transparent spinel ceramics meet all these requirements in an outstanding manner.

The manufacturing of planar transparent spinel parts with thicknesses above 2 mm using uniaxial pressing is already well-established in industrial manufacturing. However, larger and thinner plates, which are near their finish thickness, geometrically accurate and very planar, could up to now be manufactured only in a time- and cost-consuming finishing post-sintering treatment.

Within an internal Fraunhofer project, MAVO CeGlaFlex, it was possible to adapt the technological steps of powder processing, shaping, and sintering so that planar green bodies with a maximum length of 160 mm in one direction and thicknesses below 1 mm can be prepared as early as during the primary forming process, using uniaxial and cold-isostatic pressing. A multi-step sintering procedure results in high-density transparent parts with a maximum length of 110 mm in one direction, and a thickness between 0.5 and 0.8 mm. A comparatively small effort is then required to get to the necessary final thickness of 0.1–0.4 mm for covers, e.g. for smartphones. Double-sided grinding, lapping and polishing provides these transparent plates with high optical transmission near the theoretical limit, and a low haze below 2 % (diagram).

**Optical transmission und haze of a thin spinel ceramic plate with a thickness of 0.4 mm**




Thanks to the fine-grained and defect-free microstructure, the transparent spinel ceramics have a hardness of HV10 = 14.5 GPa, exceptionally high scratch resistance and sufficiently high mechanical stability (bending strength of about 280 MPa) for use in display covers.

1 *Spinel ceramic plate with a thickness of 0.8 mm.*
2 *Spinel ceramic plate with a thickness of 0.4 mm.*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