

## QSIL Ceramics expands their product portfolio

As part of a project funded by the BMBF, two ZTA mixed oxide ceramics were developed based on raw materials with a grain size in the submicron range. The new materials are characterized by significantly improved mechanical properties compared to the existing standard ZTA material AZ.

Feature	AZ 90	AZ 90 F	AZ 75 F
Classification EN 60672	C786	C786	C786
Main ingredient [Ma%]	Al <sub>2</sub> O <sub>3</sub> : ZrO <sub>2</sub> 90 : 10	Al <sub>2</sub> O <sub>3</sub> : ZrO <sub>2</sub> 90 : 10	Al <sub>2</sub> O <sub>3</sub> : ZrO <sub>2</sub> 75 : 25
Average Al <sub>2</sub> O <sub>3</sub> grain size [µm]	< 3	< 1	< 0,8
Average ZrO <sub>2</sub> grain size [µm]	< 1	< 0,3	< 0,3
Density [g/cm <sup>3</sup> ]	4,05	4,10	4,35
Bending strength [MPa]	> 400	> 500	> 800
Fracture toughness K1c [MPa.m <sup>1/2</sup> ]	4	> 4,5	> 5,0
E-Modul [GPa]	375	375	350
Hardness [N/mm <sup>2</sup> ]	> 17.500	> 18.500	> 18.000
Wear resistance [%]	100	33	25

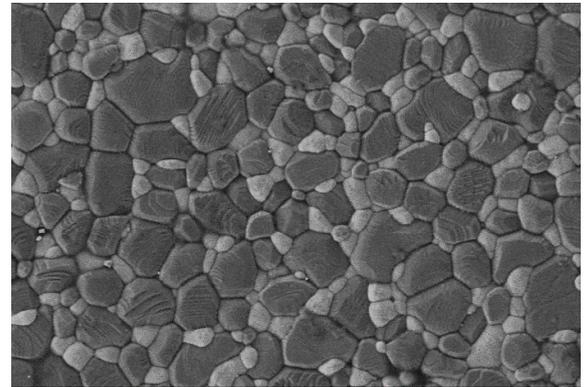


Fig. 1 SEM image of an AZ 75 F ceramic, magnification 10,000x.

## What are the benefits?

- A minimum of 3 times higher wear resistance
- > 20% higher bending strength compared to the standard ZTA-material AZ 90
- > 10% higher fracture toughness
- High surface quality, already Ra values after fine-tuning ≤ 0,1 µm (Rz ≤ 1,0 µm)

## What needs to be considered?

- Maximum volume of part is limited due to the fine-grained raw material
- Maximum operating temperature 1000 ° C for strength-related applications
- Limited fracture toughness compared to pure ZrO<sub>2</sub> materials

## Possible fields of application

For applications in which high mechanical and wear resistance, high hardness and rigidity is required, the use of the AZ 90 F is recommended (e.g. mill components, linings, wear protection during water jet cutting, plain bearings).

If the focus is on very high mechanical strength, good toughness and excellent surface quality, the use of the AZ 75 F is recommended as an inexpensive alternative to pure ZrO<sub>2</sub> materials (e.g. knives, stirring disks, valve seats and balls).

Would you like more information?