

Large Precision Surface Plate made of Ultra Low Thermal Expansion Ceramics " NEXCERA™ "

- **NEXCERA™**, a cordierite ($2\text{MgO} \cdot 2\text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2$) based polycrystalline ceramic has been developed as a cutting-edge material having both an extremely low thermal expansion coefficient and superior mechanical properties.
- **NEXCERA™** has high dimensional stability for long-term passage and temperature changes as compared to general Low thermal expansion glass (LTEG).
- **NEXCERA™** is used as calibration tools and primary standards in the field of precision metrology that requires high accuracy.
- We developed large size products of **NEXCERA™** (N119C) in this time. And it is adopted as large precision surface plate of precise measurement for thermal deformation of spacecraft structures by JAXA (Japan Aerospace Exploration Agency). (See photo1, fig.2) We have received a high evaluation with that, because the measurement error has decreased remarkably.

Advantages

- ◆ Zero thermal expansion at RT

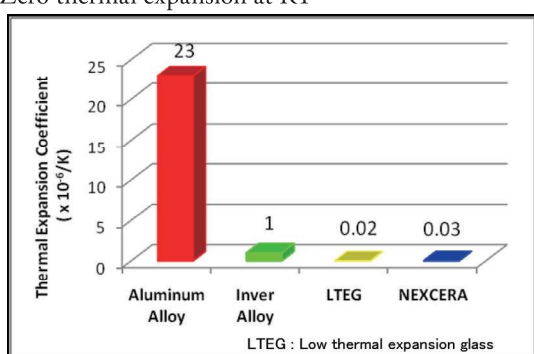


Fig.1 Comparison of Thermal Expansion Coefficient

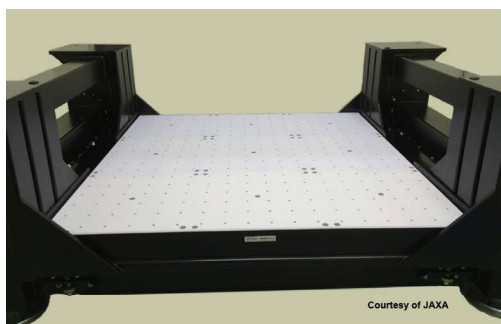


Photo1 Large Precision Surface Plate (N119C)
(Size: 1800 × 1800 mm)

- ◆ Light-weight (Bulk density 2.5 g/cm³)
It is lighter than aluminum alloy
- ◆ High accuracy mirror surfaces (N117B)
Average-roughness of less than 1nm
due to pore-less properties
- ◆ Near net shape sintering
- ◆ Large size products (N119C)

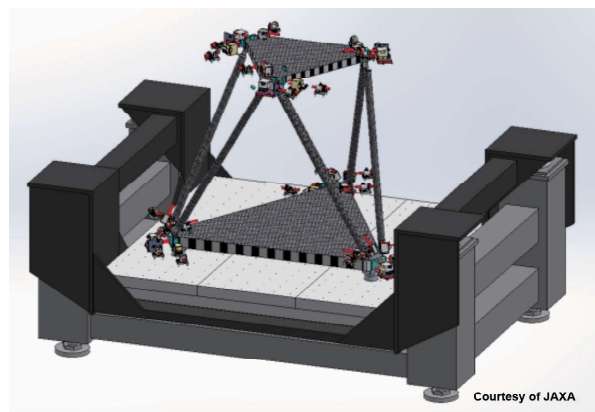


Fig.2 Application Image

Characteristics

Code	Unit	N113B Standard	N117B Mirror Surface	N119C Large-Products	LTEG Reference
Bulk density : ρ	g/cm ³	2.5	2.55	2.5	2.54
Flexural strength (at RT) : σ	MPa	210	230	166	126
Young's modulus of elasticity : E	GPa	130	140	128	90
Specific rigidity : E/ρ	GPa/(g/cm ³)	52	55	51	36
Fracture toughness (SEPB)	MPa · m ^{1/2}	1.2	1.2	1.2	-
Vickers hardness HV (98N) (at RT)	GPa	8.0	8.1	8.0	6.9
Thermal expansion coefficient: α (at RT)	$\times 10^{-6}/\text{K}$	< 0.03	< 0.03	< 0.05	< 0.02
Thermal conductivity (at RT)	W/mK	3.7	4.2	4.3	1.52
Dielectric constant (1MHz) : ϵ_r	-	4.7	6.0	4.4	-

※ The values shown above are typical ones, and not guaranteed.