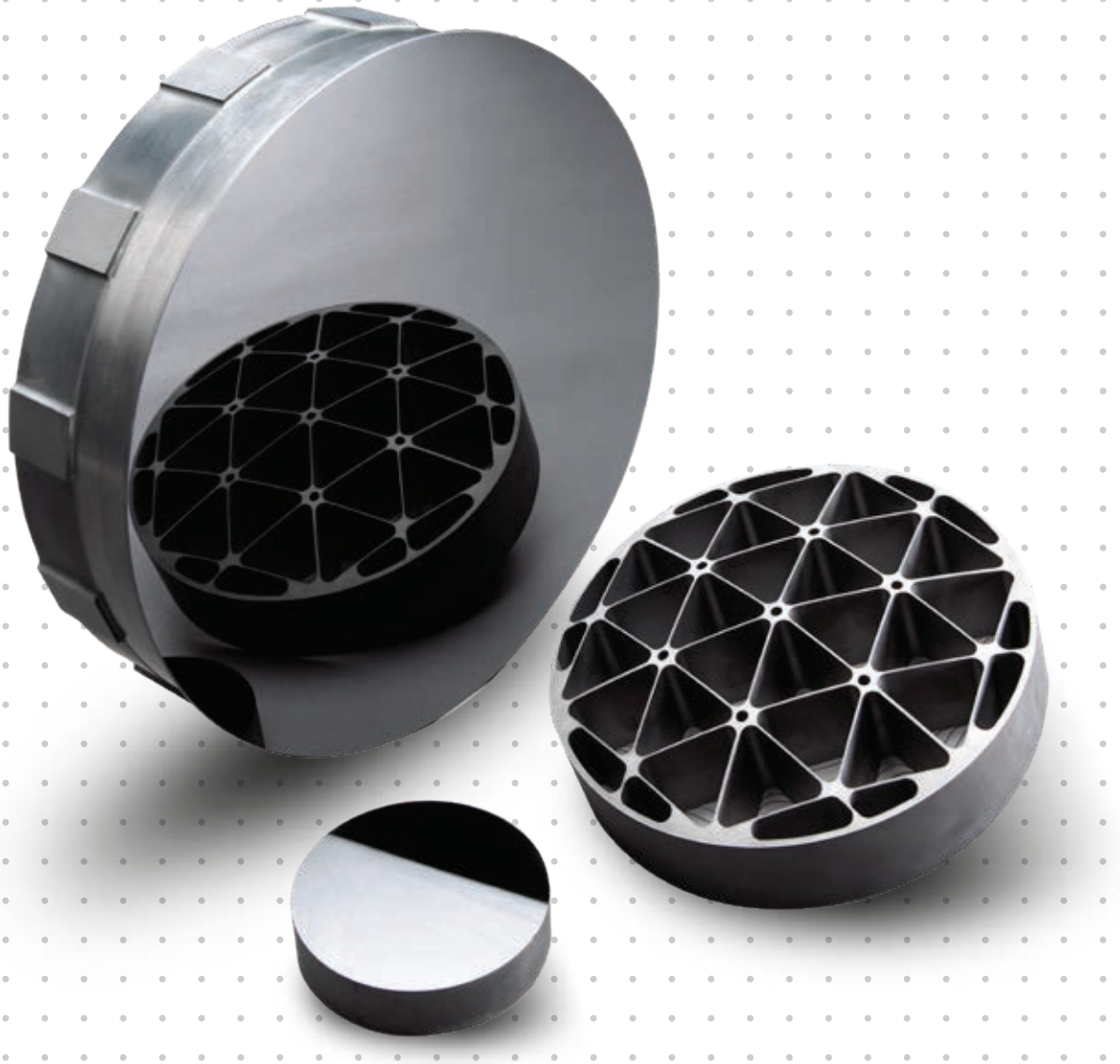
CoorsTek

# Silicon Carbide for Optical Applications



# Direct Sintered and CVD Silicon Carbide for Optical Applications

## Materials engineered specifically for optical systems

CoorsTek® silicon carbides are engineered and optimized for applications demanding high stiffness, low mass, and thermal stability. Our SiC materials are ideally suited for mirrors and structural components for ground or space-based optical systems. Silicon carbide optical systems are engineered to exhibit low complexity, low mass, and athermal designs, thereby providing enhanced system performance and reliability.

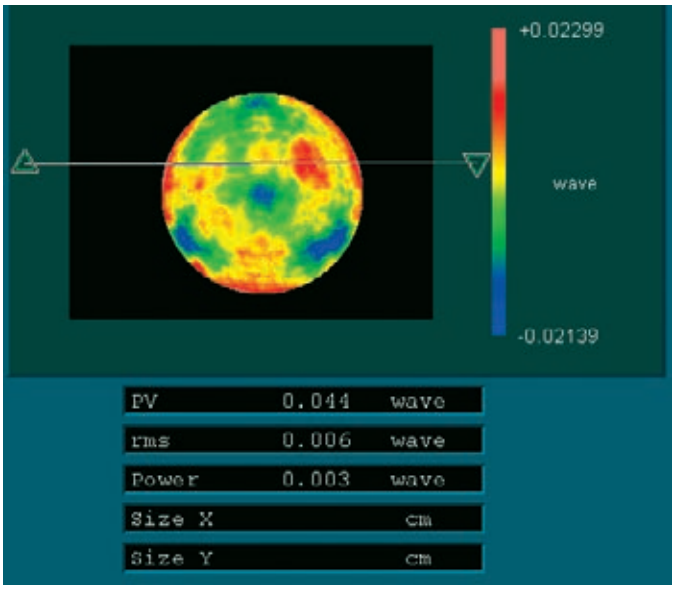
## UltraSiCTM Single Phase Silicon Carbide

Optimized with a single-phase polycrystalline structure for ultra-stable and predictable material properties over wide temperature ranges, low thermal expansion, and high thermal conductivity allow for exceptionally stable optical figures in both transient and steady-state environments. Additionally, the material's high elastic modulus and low density allow for one of the highest stiffness-to-weight ratios of any optical substrate.

**CVD silicon carbide** is chemical vapor deposited, ultra high purity material used for mirrors or as an optical cladding for UltraSiC material.

## High-precision manufacturing

Whether you need one or hundreds of components, CoorsTek precisely forms, machines, assembles, and tests SiC optical components for a variety of visible and infrared applications in dedicated, quick-turn manufacturing facilities. CoorsTek high-precision silicon carbide components feature wave front errors and surface roughness equal to or better than traditional substrates. Most typical optical coatings are compatible with our silicon carbide substrates.




This Zygo® Surface Figure Plot illustrates the exceptional flatness achieved on a CoorsTek silicon carbide optical component

## Hands-on engineering and service professionals

CoorsTek offers expert engineering services including 3D modeling, materials testing, prototyping, and material selection for any optical component specification.

**Contact us for more information**
+1 503 648 3183 or optical@coorstek.com

| PROPERTY | UNITS | TEST | ULTRASIC™ (DIRECT SINTERED SIC) | CVD SILICON CARBIDE |
|---|---|---|---|---|
| Density | gm/cc | ASTM-C20 | 3.15 | 3.21 |
| Crystal Size, Average | MICRONS | ASTM-E112 | 4 | 3 - 10 |
| Flexural Strength (MOR), 20° C | MPa (psi X $10^3$) | ASTM-C1161, 4pt | 480 (70) | 517 (75) |
| Elastic Modulus, 20° C | GPa (psi X $10^6$) | ASTM-C848 | 410 (59) | 434 (63) |
| Poisson's Ratio, 20° C | – | ASTM-C848 | 0.21 | 0.21 |
| Compressive Strength, 20° C | MPa (psi X $10^3$) | ASTM-C773 | 3500 (508) | * |
| Hardness | GPa (kg/$mm^2$) | KNOOP 100 gm | 27.4 (2800) | 27 (2750) |
| Fracture Toughness, Klc | MPa $m^{1/2}$ | Notched Beam | 4 | 3.5 |
| Thermal Conductivity, 20° C | W/m K | ASTM-C408 | 150 | 140 |
| CTE, 25-1000° C | 1X $10^{-6}$/ °C | ASTM-C372 | 4.4 | 4.6 |
| CTE @ 20° C | 1X $10^{-6}$/ °C | – | 2.1 | 2.1 |



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