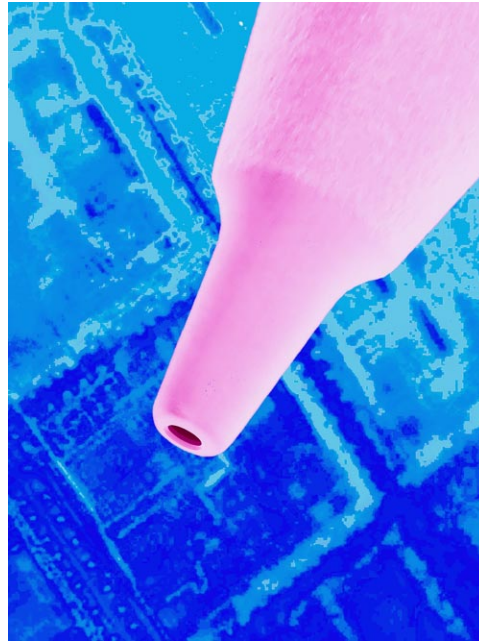
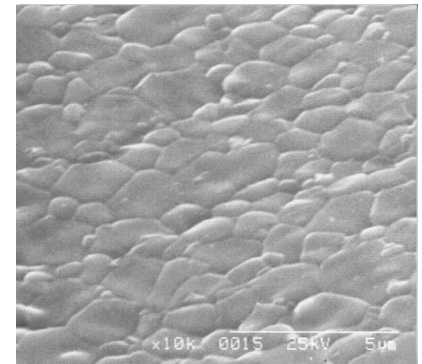


A Key New Element in The Technology Roadmap Toward the Future of Ultra Fine Pitch Ball Bonding: CZ1 Material (A Zirconia Toughened Alumina)

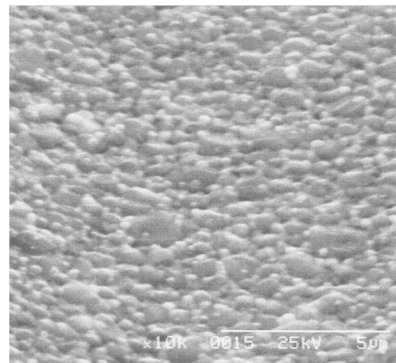


Combining Gaiser Tool Company's new CZ1 material with our exclusive proprietary Process1800 angle-bottleneck capillary produces the ultimate ultra fine pitch capillary, period.



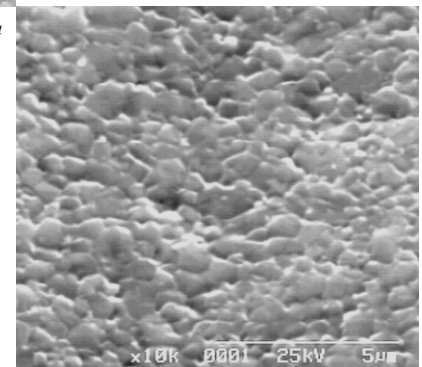
Gaiser Tool Company's Standard Alumina Ceramic Formula, < 2 micron Grain Size Near Zero Porosity

Gaiser Tool Company's new CZ1 Material is designed for world-class, high-speed, fully automatic wire bonders, for ultra fine pitch, low-loop, long-loop, demanding applications.



Gaiser Tool Company's New CZ1 Zirconia Toughened Alumina Formula < 0.7 micron Grain Size, Zero Porosity

Gaiser's famous "GM" Gaiser-Matte finish is still available for the ultimate 2nd bond ultrasonic energy transfer.



Competitors's Toughened Alumina Note Large Grain Size and Porosity

- 🔧 100% and Greater Increases in Angle-Bottleneck Break Strength vs. Conventional Capillaries
- 🔧 Longer Tool Life, Reduced Cost Per Bond, Excellent for NiPd Leadframe Applications
- 🔧 Ultrasonic Tuning is Consistent with Existing Ceramic Capillary Materials, CZ1 Offers a Wider Tuning Window for Sensitive Processes
- 🔧 Ideal for Both Standard and High Frequency Transducers
- 🔧 Sub-micron Grain Size Allows for the Manufacturing of the Smaller Geometries and the Tighter Dimensional Tolerances and Features Necessary for 50 Microns and Beyond Ultra Fine Pitch Applications
- 🔧 Improved Internal Bore Surface Provides Reduced Wire Drag, for Enhanced Looping and Wire Control

GGAISER
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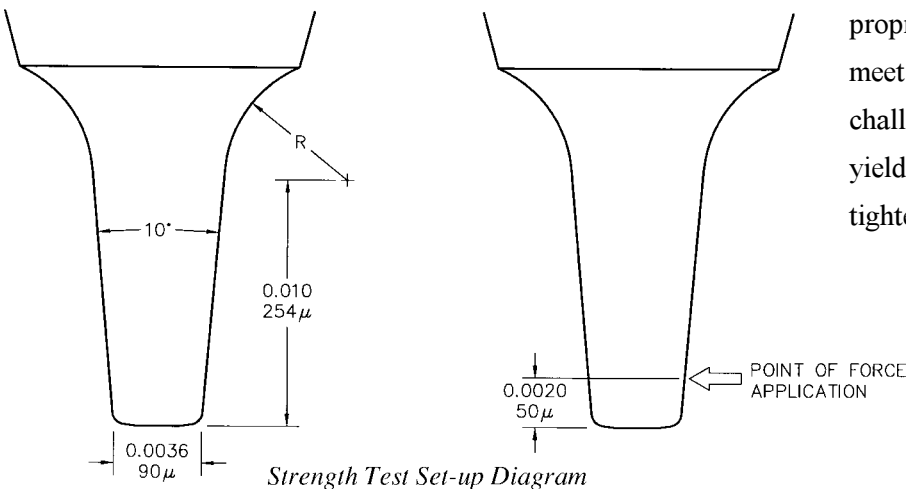
Technical Specifications

| Material Specifications | CZ1 - Zirconia Toughened Alumina | Gaiser Fine Grain Standard Alumina Ceramic |
|-------------------------------|--|--|
| Chemical Composition | Zirconia Toughened Alumina | 99.9% Al ₂ O ₃ |
| Color Appearance | Pink | White |
| Density | 4.3 g/cm ³ | 3.99 g/cm ³ |
| Average Grain Size | <0.683 microns | <2.0 microns |
| Hardness Vickers | 1900 HV | 2425 HV |
| Porosity | Zero | Near Zero |
| Bending Strength | 1700 MPa | 350 MPa |
| Thermal Conductivity | 0.072 cal/cm sec °C | 0.08 cal/cm sec °C |
| Thermal Expansion Coefficient | 6.8 x 10 ⁻⁶ cm/°C | 6.5 x 10 ⁻⁶ cm/°C |
| Surface Resistivity | 10 ¹¹ - 10 ¹³ ohm cm | 10 ¹³ - 10 ¹⁵ ohm cm |
| Fracture Toughness | 14 MN/m ^{3/2} | 3 MN/m ^{3/2} |

This new CZ1 material approaches characteristics similar to that of ruby and sapphire with increased physical strength and wear resistance resulting in extended tool life. With CZ1 you will see improved bond quality along with reduced cost per bond.

Strength Test Data

| | Standard Manufacturing of 99.9% Al ₂ O ₃ | Process1800 Al ₂ O ₃ | Process1800 CZ1 |
|---------------------------|--|--|----------------------------|
| Capillary ABTNK | 10° ABTNK | 10° ABTNK | 10° ABTNK |
| Manufacturing Method | Standard Grinding | Process1800 | Process1800 |
| Capillary Material | 99.9% Al ₂ O ₃ | 99.9% Al ₂ O ₃ | Zirconia Toughened Alumina |
| Tip Diameter | 0.0036 in. / 90 microns | 0.0036 in. / 90 microns | 0.0036 in. / 90 microns |
| ABTNK Height | 0.010 in. / 254 microns | 0.010 in. / 254 microns | 0.010 in. / 254 microns |
| Core Angle | 10° | 10° | 10° |
| Lot No. | L7A | L7A | J1 |
| No. of Tools Tested | 25 | 25 | 25 |
| Mean ABTNK Break Strength | 142 Grams | 272 Grams | 323 Grams |



Our new CZ1 material combined with our exclusive proprietary Process 1800 manufacturing process will meet and exceed the current and upcoming challenges of the ultra pitch technology road map yielding improved tool strength, tool life, and tighter tolerances.

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