

AlBeMet® I62H for Optical Substrates and Electro-Optical Systems

ALBEMET®

AlBeMet® is an alloy consisting of commercially pure beryllium a commercially pure aluminum but can be considered a composite. AlBeMet® sheet, plate and bar are powder metallurgy products. The powder is produced by a gas atomization process which yields spherical powder with a fine beryllium structure and is densified by three consolidation processes, each resulting in different mechanical properties while maintaining AlBeMet®'s unique physical properties.



Designers seeking improved performance are looking beyond the capabilities of aluminum and other more common materials. In many cases they are finding unmanageable costs or unattractive tradeoffs. Aluminum-beryllium gives them the combination of properties that consistently meet their expectations.

ADVANTAGES OVER ALUMINUM

- Three times the stiffness
- 22% less dense
- Matches CTE of Electroless Nickel (EN) to within 1ppm
- Superior surface quality with the EN AlBeMet matrix
- 28% higher thermal conductivity

ATTRIBUTES

- Weldable for the manufacturing of structures and defect repair
- Excellent damping properties for products such as stabilized head mirrors
- Machinable – similar to aluminum
- Moderate cost to increase performance at a lesser weight
- Demonstrated to be thermally stable over temperature ranges of -50°F to 150°F

Temperature (°F)	P-V	RMS (λ)	P-V (λ)	ΔRMS (λ)
6.0" Diameter Plano Mirror Substrate – 4.0" Diameter Test Area				
<i>Nickel Plating Both Sides (S/N 1)</i>				
+151	0.149	0.029	0.070	0.013
70	0.079	0.016		
-47	0.188	0.043	0.109	0.027
<i>Nickel Plating Mirror Surface Only (S/N 1)</i>				
+150	0.103	0.019	0.040	0.014
70	0.142	0.033		
-50	0.198	0.042	0.056	0.010
6.0" Diameter Plano Mirror Substrate - 6.0" Diameter Test Area				
<i>Nickel Plating Both Sides (S/N 1)</i>				
Ambient	0.567	0.110		
-72	0.514	0.079	0.53	0.031
<i>Nickel Plating Both Sides (S/N 2)</i>				
Ambient	0.723	0.137		
+150	0.635	0.117	0.088	0.02
-49	0.84	0.124	0.12	0.02
8.0" Diameter Spherical Mirror Substrate				
Ambient	0.475	0.069		
+151	0.459	0.065	0.016	0.004
-50	0.421	0.065	0.054	0.004

λ = angstroms

ALBEMET® I62H OPTICAL SUBSTRATE MATERIALS COMPARISON

Property		AlBeMet® HIPd	AL 6061 T6	BeS200 F I-70H	Stainless Steel 416	LANXIDE Al/SiC 30p	SXA MMC 2124-T6 30% Vol Si Cp	Fused Silica	ULE	SiC (RB)	Zerodur
<i>Density</i> g/cc (Lb/in ³)	ρ	2.10 (0.075)	2.69 (0.098)	1.85 (0.067)	7.75 (0.280)	2.78 (0.101)	2.91 (0.105)	2.19 (0.080)	2.21 (0.081)	2.95 (0.107)	2.53 (0.091)
<i>Modulus of Elasticity</i> GPa (MSI)	E	192 (28)	69 (10)	303 (44)	200 (29)	125 (18)	117 (17)	72 (10.4)	67.6 (9.8)	311 (45.0)	90.3 (13.2)
<i>Thermal Conductivity</i> W/m-K (BTU/hr ft °F)	k	210 (121)	167 (96.5)	216 (125)	24.9 (14.4)	160 (92)	123 (72)	1.4 (0.80)	1.31 (0.76)	152 (87.9)	1.46 (0.84)
<i>CTE</i> PPM/°C (PPM/°F)	α	13.9 (7.73)	22.9 (12.70)	11.4 (6.30)	9.9 (5.50)	14 (7.80)	12.4 (6.90)	0.5 (0.28)	0.03 (0.017)	2.52 (1.40)	0 (0°C-100°C)
<i>Specific Heat</i> J/Kg K (BTU/Lb °F)	Cp	1506 (0.36)	896 (0.21)	1925 (0.46)	460 (0.11)	820 (0.196)	870 (0.21)	750 (0.18)	766 (0.183)	670 (0.16)	800 (0.19)
<i>Specific Stiffness</i> GPa m3 g⁻¹ (10 ⁶ in)	E/ρ	91 (373)	25 (102)	164 (660)	25.4 (104)	45 (178)	40.2 (162)	32.9 (132)	30.3 (122)	105 (421)	35.7 (146)
<i>Thermal Diffusivity</i> 10⁻²cm²/s (10 ⁻² in ² /s)	k/Cρp	66.4 (10.3)	69 (10.7)	60 (9.3)	6.98 (1.08)	70 (10.9)	49 (7.6)	0.85 (0.13)	0.78 (0.12)	77 (11.6)	0.72 (0.11)
<i>Microyield Strength</i> MPa (Ksi)	óμγ	17.3 (2.50)	240 (35.00)	30 (4.30)	>300 (>43)	>200 (>29)	>200 (>29)	Not Available	Not Available	Not Available	Not Available

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Notes: Handling Aluminum-Beryllium Alloys in solid form poses no special health risk. Like many industrial materials, beryllium-containing materials may pose a health risk if recommended safe handling practices are not followed. Inhalation of airborne beryllium may cause a serious lung disorder in susceptible individuals. The Occupational Safety and Health Administration (OSHA) has set mandatory limits on occupational respiratory exposures. Read and follow the guidance in the Material Safety Data Sheet (MSDS) before working with this material. For additional information on safe handling practices or technical data on Aluminum Beryllium Alloys, contact Brush Beryllium & Composites.