



PRODUCTS, USES & DESCRIPTIONS

	PRODUCT	FORM	AVIONICS	OPTICAL & SATELLITE STRUCTURES	NUCLEAR	DESCRIPTION
HOT ISOSTATICALLY PRESSED	S-200FH	Net Shapes Rod, Bar, Block		<ul style="list-style-type: none"> High First Mode Frequencies, 3X over Al, Doubles operating speed of bar code readers, laser printers, & other scanners Optical Sensors: NPOESS/CRIS, APL-5, Mass Mounted Sites, Sniper, LANTIRN Mechanisms, Gimbals, Yokes 	<ul style="list-style-type: none"> Reflector and moderator of neutrons in nuclear environments Materials test reactors 	A lightweight, high stiffness material, while maintaining typical metal properties. Selected when weight & inertia factors exceed those of lower cost aluminum. AMS 7908 44 Msi Elastic Modulus Density 1.84 g/ml
	I-70H, O-30H	Net Shapes Rod, Bar, Block		<ul style="list-style-type: none"> Low Scatter Optics Cryogenic Optical Substrates High Thermal Isotropy Optical Benches, Metering Rods 		O-30H is lowest oxide grade of Be at 0.5% maxi. Highest isotropy of thermal & mech properties of any grade of Be & is ideally suited for cryogenic apps. Density 1.84 g/ml, 44 Msi Elastic Modulus
	S-65H	Net Shapes Rod, Bar, Block	Useful in inertial guidance industry; Trident, Minuteman & Peacekeeper Guidance	<ul style="list-style-type: none"> Used as ni-plated optical substrate for hi dimensional stability; Telescope support for exploring deep space; VLT Optics, LIDARS 	<ul style="list-style-type: none"> Tiles for JET ITER-like wall project 	Has the highest microyield strength of beryllium and for low creep.
	I-220H	Net Shapes Rod, Bar, Block			<ul style="list-style-type: none"> Fusion energy applications: First Wall in ITER and breeder pebbles for ITER TBM & demo 	Has the highest microyield strength of beryllium and for low creep.
	AMI62H	Net Shapes Rolled Sheet, Extruded Bar, Block	Minimizes stress from vibration on leads, solder joints & substrates, increases fatigue life of electronic packages, reduced section thickness, adjusts for platform req. Faster designs versus composites	<ul style="list-style-type: none"> Higher first mode frequencies, improved LOS jitter, more room inside housing IPTS, APACHE, SPIRITT, JSF, F18/22, FLIR, ATP, Damocles, Tammac Lighter, stiffer, thermally-stable vs. Al, Flying on 150 satellites, Not susceptible to SSC; AEHF, KAP 	<ul style="list-style-type: none"> Potential use as holder for reflector material in test reactors Beam pipe material in high energy particle physics applications 	Contains 62 wt.% commercially pure beryllium and 38 wt.% commercially pure aluminum EB weldable, TIG weldable, DIP and Vacuum brazing. Machines like aluminum, can be coated like aluminum, AMS 7911, 7912, 7913. Density 2.1 g/ml; 28 Msi Modulus
	SupremEX™ BI35H	HIP Block, Forged /Extruded		<ul style="list-style-type: none"> Structures, gimbals, mechanisms Mirrors 		
BERYLLIUM	S200F	VHP'd Shapes Rod, Bar, Block		<ul style="list-style-type: none"> Nickel-Plated Optical substrates NPOESS/CRIS Structures, gimbals, mechanisms Spacecraft structures, small rocket nozzles, inertial guidance systems 	<ul style="list-style-type: none"> Reflector and moderator of neutrons in nuclear environments Materials test reactors like the Advanced Test Reactor (ATR) & Japan Mats Test Reactor (JMTR) 	A versatile material selected when weight & inertia factors exceed those of lower cost aluminum. With its low mass, it can be driven through the scanning cycle much faster, with lower power requirements.
	S-65	HIP'd Shapes Rod, Bar, Block			<ul style="list-style-type: none"> Fusion energy applications: First wall in ITER and breeder pebbles 	Where weight and volume are a consideration, or a high neutron flux is desired, beryllium is very useful as both a moderator and reflector of neutrons.
	S200FC	Cold Isostatic Pressed Shapes		<ul style="list-style-type: none"> Optical Substrate for Fire control systems in tanks and aircraft Mirrors 	<ul style="list-style-type: none"> JET RF Antenna and Belt Limiter Tiles (cold pressed and sintered) 	Available by CIPing. Useful for apps requiring lesser properties than obtained by HIP. Tooling is reusable, good for parts required in the hundreds.

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	PRODUCT	FORM	AVIONICS	OPTICAL & SATELLITE STRUCTURES	NUCLEAR	DESCRIPTION
eMATERIALS	E20 E60	Bar Shapes Plates	Aircraft avionics, SEM-E modules, 6UV Modules Iridium MCM-L Electronic Substrates Heat Sinks/Chill Plates F22, F16, F18, JSF	<ul style="list-style-type: none"> Optical Benches Lens Housing Material to match CTE of lens materials Have demonstrated their value in airborne and space-based electronic applications Iridium, Gal Star 		<ul style="list-style-type: none"> Offers improved electronic component life due to lower displacement, improved solder joint life. High Stiffness, Low CTE, High Therm. Cond. E20 Density 2.1 g/ml, 44 Msi Elastic Modulus E40 Density 2.3 g/ml, 46 Msi Elastic Modulus E60 Density 2.55 g/ml, 48 Msi Elastic Modulus
	AM162	Net Shapes Rolled Sheet, Extruded Bar, Block	Minimizes stress from vibration on leads, solder joints & substrates, increases fatigue life of electronic packages, reduced section thickness, adjusts for platform req. Faster designs versus composites	<ul style="list-style-type: none"> Higher first mode frequencies, improved LOS jitter, more room inside housing IFTS, APACHE, SPIRITT, JSF, F18/22, FLIR, ATP, Damocles, Tammac Lighter, stiffer, thermally-stable vs. Al, Flying on 150 satellites, Not susceptible to SSC; AEHF, KAP 	Potential use as sample holder for materials test reactors	<ul style="list-style-type: none"> Contains 62 wt.% commercially pure beryllium and 38 wt.% commercially pure aluminum EB Weldable, TIG weldable, DIP and Vacuum brazing & machines like aluminum, can be coated like aluminum, AMS 7911, 7912, 7913. Density 2.1 g/ml; 28 Msi Modulus
ALUMINIUM BERYLLIUM	AM140	Rolled Sheet Extrusions	Minimizes stress from vibration on leads, solder joints & substrates, increases fatigue life of electronic packages, reduced section thickness, design flexibility. JSF Heatsinks, Dip brazed chassis	<ul style="list-style-type: none"> Honeycomb Panel skins versus composites, Al: 0.010" thick Microwave tubes – 20% lighter than Aluminum Lighter, stiffer, thermally-stable versus aluminum & composites 	Potential use as sample holder for materials test reactors	<ul style="list-style-type: none"> Contains 40 wt.% commercially pure beryllium and 60 wt.% commercially pure aluminum Cold formable, can be stamped, EB & TIG weldable, DIP and Vacuum Brazing, machines like aluminum. Density 2.3 g/ml; 22 Msi Modulus

Material Property Comparison

Property	Beryllium S200F/AMS7906	AlBeMet® AM162H/AMS7911	AlBeMet® AM140 (Sheet/Ext)	E-Material E-60	Magnesium AZ80A T6	Aluminum 6061 T6	Stainless Steel 304	SupremEX™ B135H	Titanium Grade 4
Density, lbs/in ³ (g/ml)	0.067 (1.85)	0.076 (2.10)	0.082 (2.28)	0.091 (2.51)	0.065 (1.80)	0.098 (2.70)	0.29 (8.0)	0.094 (2.60)	0.163 (4.5)
Modulus, MSI (GPa)	44 (303)	28 (193)	22 (150)	48 (331)	6.5 (45)	10 (69)	30 (205)	18.2 (125)	15.2 (105)
Ultimate Tensile Strength, KSI (MPa)	47 (324)	38 (262)	40 (276)	39.3 (273)	49 (340)	45 (310)	75 (515)	44.8 (309)	95.7 (660)
Yield Strength, KSI (MPa)	35 (241)	28 (193)	27 (186)	N/A	36 (250)	40 (275)	30 (205)	30.4 (210)	85.6 (590)
Elongation %	2	2	14/16	<0.05	5	12	40	2.7	20
Fatigue Strength, KSI (MPa)	39 (261)	14 (97)	21 (145)/14 (97)	N/A	14.5 (100)	14 (95)	N/A	14.8 (102)	N/A
Thermal Conduct Btu/hr/ft/°F (W/m.K)	125 (216)	121 (210)	119 (204)	138 (230)	44 (76)	104 (180)	9.4 (16)	113	9.75 (16.9)
Heat Capacity, Btu/lb.°F (J/g.K)	0.46 (1.95)	0.373 (1.56)	0.334 (1.416) Est.	0.310 (1.26)	0.251 (1.05)	0.214 (0.896)	0.12 (0.5)		0.129 (0.54)
CTE, ppm/°F (ppm/K)	6.3 (11.3)	7.7 (13.9)	9.1 (16.5)	3.4 (6.1)	14.4 (26)	13 (24)	9.6 (17.3)	13.5	4.8 (8.6)
Electrical Resistivity, ohm-cm (x 10 ⁶)	4.2	3.5	TBD	N/A	14.5	4	72		60

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