

ALON® - Aluminum Oxynitride

An Advanced Polycrystalline Transparent Ceramic

The ALON® Technology



- ALON® (aka Transparent Aluminum) is crystal-clear and ultra-hard advanced transparent ceramic material that is manufactured via powder processing. It has been fielded in many defense systems and is available commercially in large sizes and quantities.
- ALON® is the best transparent ceramic armor there is and the material of choice for ultra high resolution reconnaissance windows.
- Surmet is the sole owner of ALON® technology. Over the last 12+ years, Surmet has made substantial investment and technical efforts in building a vertically integrated manufacturing capability and is now proudly announcing commercial availability of ALON® in large volumes and in very large sizes.
- Surmet won prestigious “Corporate Technical Achievement Award (CTAA)” by ACerS for successfully developing and commercializing ALON®.

The ALON® Advantage

- **Transparent:** High optical transmission (>85%) near-UV to mid-IR wavelengths (0.25 to 4.0 μm).
- **Crystal Clear:** Excellent clarity and no inherent birefringence. Very high refractive index homogeneity over large areas.
- **Durable:** Outstanding hardness, scratch resistance, chemical resistance and high strength.
- **Commercially Available:** Large 18x35-in windows as well as shapes including hyper-hemispherical, ogive and hemispherical domes are available.
- **Robust Process:** Enables Surmet to reliably manufacture and supply components of consistently high quality.



Contact us:

Headquarters: 31 B Street, Burlington, MA 01803. U.S.A

✉ sales@surmet.com

☎ +1 781 272 3969

www.surmet.com

Disclaimer: Surmet and its affiliates reserve the right to alter the product(s) and/or information contained herein without notice. Surmet makes no warranty, representation or guarantee regarding the suitability of its products and/or specifications for any particular purpose, nor does Surmet assume any liability whatsoever arising out of the use or application of any product(s) or information contained herein. © 2016 Surmet Corporation. All rights reserved.



ALON® - Technical Data

General Properties

Chemical Formulae	$Al_{23-1/3X}O_{27+X}N_{5-X}$ (0.429 < X < 2)
Crystal Structure	Cubic, Spinel
Form	Polycrystalline

Physical/Mechanical

Density (g/cc)	3.68 - 3.69
Flexural Strength (MPa)	350 - 640*
Hardness (kg/mm ² , Knoop, 200g)	1,850 (9 Moh's scale)
Elastic/Young's Modulus (GPa)	320
Fracture Toughness (MPa - m ^{1/2})	2.0 - 2.9
Compressive Strength (GPa)	2.7

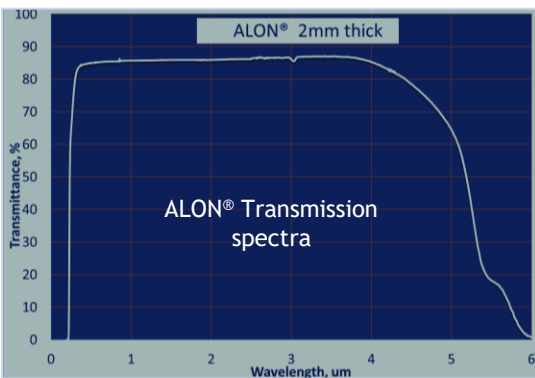
ALON® Transparent Armor Ballistic Performance

Proven lightweight designs for 5.56, 7.62 and 12.5 mm threats including Armor Piercing and Multi-hit performance

STANAG 4569 Level, 3-shots	1	2	3	50calAP 1 shot
Areal density, kg/sq.m.	57	69	130	83
Thickness, mm	31	37	59	41

Optical

Transmission range (>80%)	~0.22 - 4.5 micron	
Refractive index	Index of Refraction	
	$\lambda(\mu m)$ n	
	0.48	1.803
	0.50	1.801
	0.64	1.790
	0.68	1.788
	0.70	1.787
	1.00	1.779
	2.00	1.761
	3.00	1.737
4.00	1.702	
5.00	1.653	
Typical Haze	<3%	
Typical Clarity	>95%	
Typical RI inhomogeneity	5ppm over 11-inch dia aperture	



Thermal

Melting Point (°C)	2,150
Thermal Conductivity (W/mK)	~13
Coefficient of Thermal Expansion (x10 ⁻⁶)	7.50 (30-900°C)
Specific Heat (cal/g-°C)	0.22
Max. Usable Temperature (inert atm.)	1,900°C

Electrical

Volume resistivity [§] (ohm-cm)	>10 ¹⁴
Dielectric Constant	f (GHz) k
	35-45 9.19
	55-60 9.18
	90-110 9.17
Loss Tangent (tan d, x10 ⁻⁵)	f (GHz) tan d
	35-45 31
	55-60 67
	90-110 96
Dielectric Strength (kV/mm)	~23 [§] Projected (not measured)

Chemical/Environmental

Chemical	Resistant (Yes/No)
HF Acid	Yes
Fluorine Plasma	Yes
Extreme Weather	Yes
Sea/Salt Water	Yes
Cryogenic Temperatures	Yes

Biological

Non-toxic and Biocompatible (Based on in vitro cell biology test results and in vivo test results in a rat distal femur model)	
Better Wear Resistance than Alumina in DMEM cell media (Wear rate: 1.845 ± 0.428 (x10 ⁻⁶ mm ³ N ⁻¹ m ⁻¹) - 1000m with 10N load)	

Contact us:

Headquarters: 31 B Street, Burlington, MA 01803. U.S.A

✉ sales@surmet.com

☎ +1 781 272 3969

www.surmet.com

Disclaimer: Surmet and its affiliates reserve the right to alter the product(s) and/or information contained herein without notice. Surmet makes no warranty, representation or guarantee regarding the suitability of its products and/or specifications for any particular purpose, nor does Surmet assume any liability whatsoever arising out of the use or application of any product(s) or information contained herein. © 2016 Surmet Corporation. All rights reserved.

