

SLL 79-076/M

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WINDOW MATERIALS PROPERTIES

CaF₂ SrF₂
KCl NaCl
ZnSe

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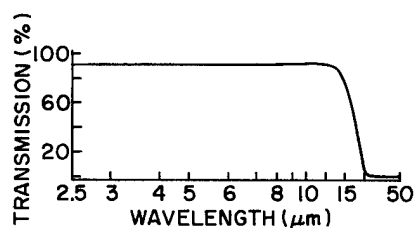
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PROPERTIES OF HOT-FORGED SODIUM CHLORIDE (NaCl)^{ac}

OPTICAL PROPERTIES:

Wavelength (μm)	2.8	3.8	5.3	9.28	10.6
Absorption (cm ⁻¹ × 10 ⁻⁴)..	10.0	4.80	1.59	12.6	11.8
dn/dT (× 10 ⁻⁵).....	-3.28	-3.28	-3.17	-2.41	-2.20
Refractive Index.....	1.53	1.53	1.52	1.49	1.49

TRANSMISSION:



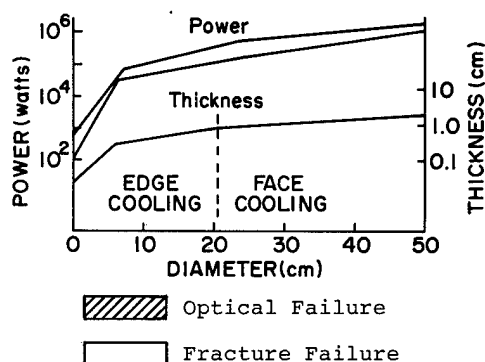
MECHANICAL PROPERTIES:

Poisson Ratio.....	0.25
Yield Strength (psi)....	4000
Youngs Modulus (psi)....	5.80 × 10 ⁶

THERMAL AND PHYSICAL PROPERTIES:

Density (g/cc).....	2.16
Expansion Coefficient (°K ⁻¹)....	44.0 × 10 ⁻⁶
Grain Size (microns).....	8.9
Hardness (knoop).....	18.0
Heat Capacity (j/g °K).....	0.857
Resistivity (ohm-cm).....	insulator
Solubility (g/100g H ₂ O @ 25°C).....	35.7
Thermal Conductivity (w/cm °K)...	0.00371

FIGURE-OF-MERIT ESTIMATES OF POWER AND THICKNESS^b:



^a Compilation of this data supported by the Air Force Materials Laboratory

^b M. Sparks and H.C. Chow, Third Conference on High Power Infrared Laser Window Materials, Vol. III, 1083 (1974)

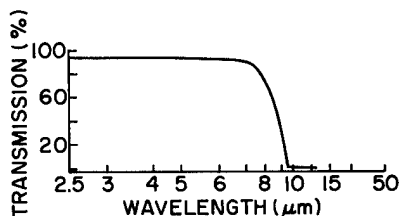
^c Additional data may be obtained from the University of Dayton Research Institute, Optical Materials Research, KL542 (J. Detrio) 300 College Park Ave., Dayton, Ohio 45469.

PROPERTIES OF FUSION CAST CALCIUM FLOURIDE (CaF₂)^{ac}

OPTICAL PROPERTIES:

Wavelength (μm)	2.8	3.8	5.3	9.28	10.6
Absorption (cm ⁻¹ ÷10 ⁻⁴)..	8.70	7.24	5.79	---	----
dn/dT (÷10 ⁻⁵).....	-1.28	-1.22	-0.72	-0.56	-0.56
Refractive Index.....	1.42	1.42	1.39	1.32	1.31

TRANSMISSION:



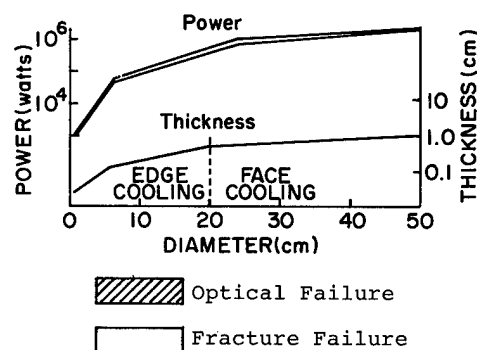
MECHANICAL PROPERTIES:

Poisson Ratio.....0.28
Fracture Strength (psi)....11800
Youngs Modulus (psi).....15.7x10⁶

THERMAL AND PHYSICAL PROPERTIES:

Density (g/cc).....3.18
Expansion Coefficient (°K⁻¹)....21.2x10⁻⁶
Grain Size (cm).....2-5
Hardness (knoop).....172
Heat Capacity (j/g°K).....0.812
Resistivity (ohm-cm).....insulator
Solubility (g/100gH₂O@25°C).....0.0017
Thermal Conductivity (w/cm°K)...0.080

FIGURE-OF-MERIT ESTIMATES OF POWER AND THICKNESS^b:



^a Compilation of this data supported by the Air Force Materials Laboratory

^b M. Sparks and H.C. Chow, Third Conference on High Power Infrared Laser Window Materials, Vol.III, 1083(1974).

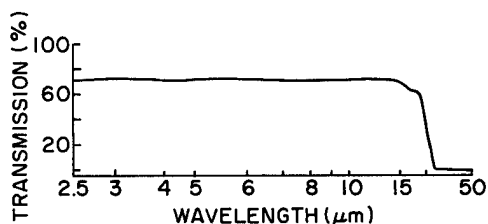
^c Additional data may be obtained from the University of Dayton Research Institute, Optical Materials Research, KL542 (J. Detrio) 300 College Park Ave., Dayton, Ohio 45469.

PROPERTIES OF CVD ZINC SELENIDE (ZnSe)^{a,c}

OPTICAL PROPERTIES:

Wavelength (μm)	2.8	3.8	5.3	9.28	10.6
Absorption (cm ⁻¹ × 10 ⁻⁴)...	25.06	15.67	5.38	34.40	21.40
dn/dT (× 10 ⁻⁵).....	5.34	5.34	----	6.08	6.17
Refractive Index.....	2.43	2.43	2.43	2.41	2.41

TRANSMISSION:



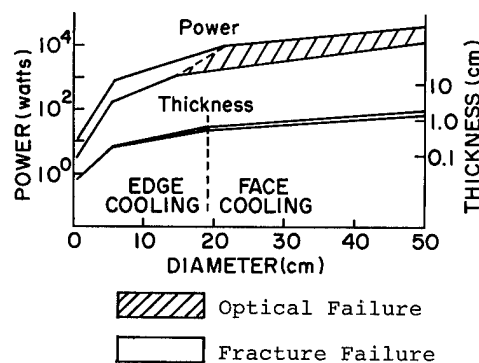
MECHANICAL PROPERTIES:

Poisson Ratio.....	0.28
Yield Strength (psi).....	7500
Youngs Modulus (psi).....	9.75 × 10 ⁶

THERMAL AND PHYSICAL PROPERTIES:

Density (g/cc).....	5.27
Expansion Coefficient (°K ⁻¹)....	7.80 × 10 ⁻⁶
Grain Size (microns).....	72.0
Hardness (knoop).....	100
Heat Capacity (j/g °K).....	0.355
Resistivity (ohm-cm).....	1.00 × 10 ¹²
Solubility (g/100gH ₂ O@25°C).....	insoluble
Thermal Conductivity (w/cm °K)...	0.170

FIGURE-OF-MERIT ESTIMATES OF POWER AND THICKNESS^b:



^a Compilation of this data supported by the Air Force Materials Laboratory

^b M. Sparks and H.C. Chow, Third Conference on High Power Infrared Laser Window Materials, Vol.III, 1083(1974).

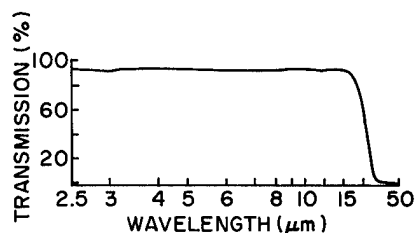
^c Additional data may be obtained from the University of Dayton Research Institute, Optical Materials Research, KL542 (J. Detrio) 300 College Park Ave., Dayton, Ohio 45469.

**PROPERTIES OF HOT-FORGED POTASSIUM CHLORIDE
WITH RUBIDIUM CHLORIDE (KCl-0.0175 RbCl)^{abd}**

OPTICAL PROPERTIES:

Wavelength (μm)	2.8	3.8	5.3	9.28	10.6
Absorption ($\text{cm}^{-1} \div 10^{-4}$)..	11.60	1.50	1.00	13.00	9.21
dn/dT ($\div 10^{-5}$).....	-3.40	-3.40	-3.15	-3.13	-3.13
Refractive Index.....	1.46	1.46	1.47	1.45	1.45

TRANSMISSION:



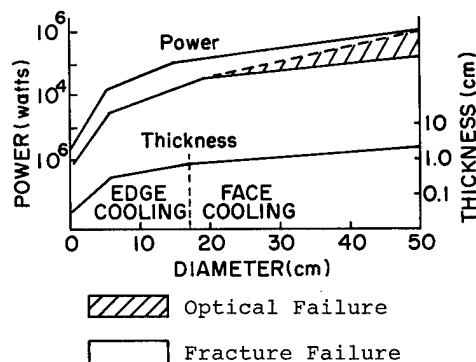
MECHANICAL PROPERTIES:

Poisson Ratio.....0.20
Yield Strength(psi)....3000
Youngs Modulus(psi).... 3.20×10^6

THERMAL AND PHYSICAL PROPERTIES:

Density (g/cc).....1.987
Expansion Coefficient ($^{\circ}\text{K}^{-1}$).... 40.0×10^{-6}
Grain Size (microns).....7.0
Hardness (knoop).....11.0
Heat Capacity (j/g $^{\circ}\text{K}$).....0.647
Resistivity (ohm-cm).....insulator
Solubility (g/100gH₂O@25 $^{\circ}\text{C}$).....3.47
Thermal Conductivity (w/cm $^{\circ}\text{K}$)...0.033

**FIGURE-OF-MERIT ESTIMATES OF POWER
AND THICKNESS^c:**



^a Compilation of this data supported by the Air Force Materials Laboratory.

^b Basic composition can be doped with nominally 10ppm Eu⁺⁺ for increased microstructure stability.

^c M. Sparks and H.C. Chow, Third Conference on High Power Infrared Laser Window Materials, Vol.III, 1083(1974).

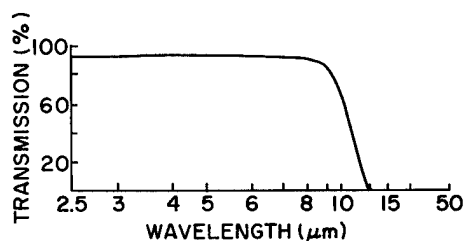
^d Additional data may be obtained from the University of Dayton Research Institute, Optical Materials research, KL542 (J.A. Detrio) 300 College Park Ave., Dayton, Ohio 45469

PROPERTIES OF FUSION CAST STONTIUM FLUORIDE (SrF₂)^{ao}

OPTICAL PROPERTIES:

Wavelength (μm)	2.8	3.8	5.3	9.28	10.6
Absorption (cm ⁻¹ ÷10 ⁻⁴)..	5.77	3.25	2.34	----	----
dn/dT(÷10 ⁻⁵).....	-1.19	-1.19	-1.19	-1.19	-1.19
Refractive Index.....	1.42	1.42	1.40	1.37	1.36

TRANSMISSION:



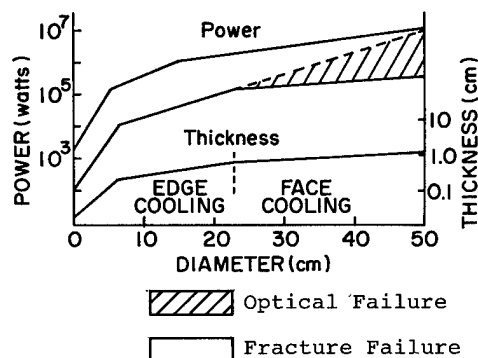
MECHANICAL PROPERTIES:

Poisson Ratio.....	0.26
Fracture Strength (psi)...	10600
Youngs Modulus (psi).....	12.1x10 ⁶

THERMAL AND PHYSICAL PROPERTIES:

Density (g/cc).....	4.278
Expansion Coefficient (°K ⁻¹)....	21.3x10 ⁻⁶
Grain Size (cm).....	2-5
Hardness (knoop).....	154
Heat Capacity (j/g°K).....	0.556
Resistivity (ohm-cm).....	insulator
Solubility (g/100gH ₂ O@25°C).....	0.0119
Thermal Conductivity (w/cm°K)...	0.074

FIGURE-OF-MERIT ESTIMATES OF POWER AND THICKNESS^b:



^a Compilation of this data supported by the Air Force Materials Laboratory

^b M. Sparks and H.C. Chow, Third Conference on High Power Infrared Laser Window Materials, Vol.III, 1083(1974).

^c Additonal data may be obtained from the University of Dayton Research Institute, Optical Materials Research, KL542 (J. Detrio) 300 College Park Ave., Dayton, Ohio 45469.