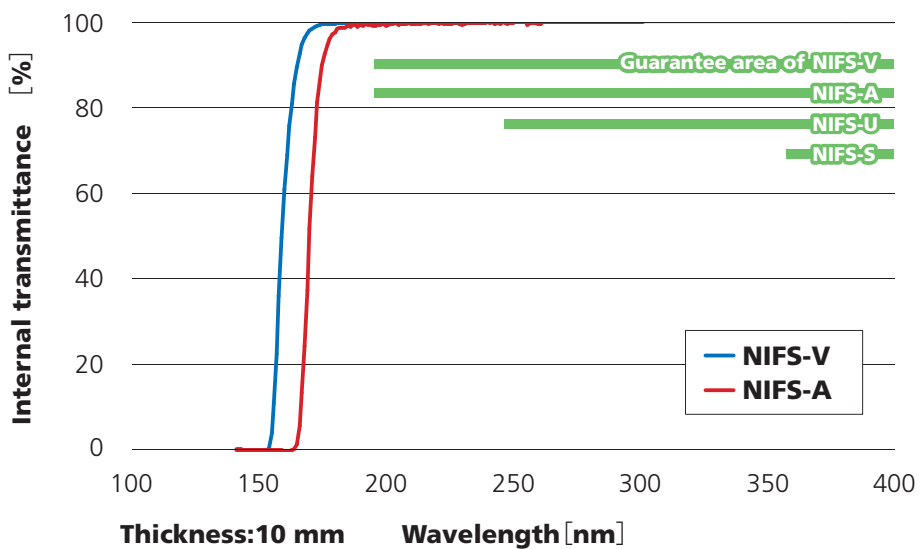
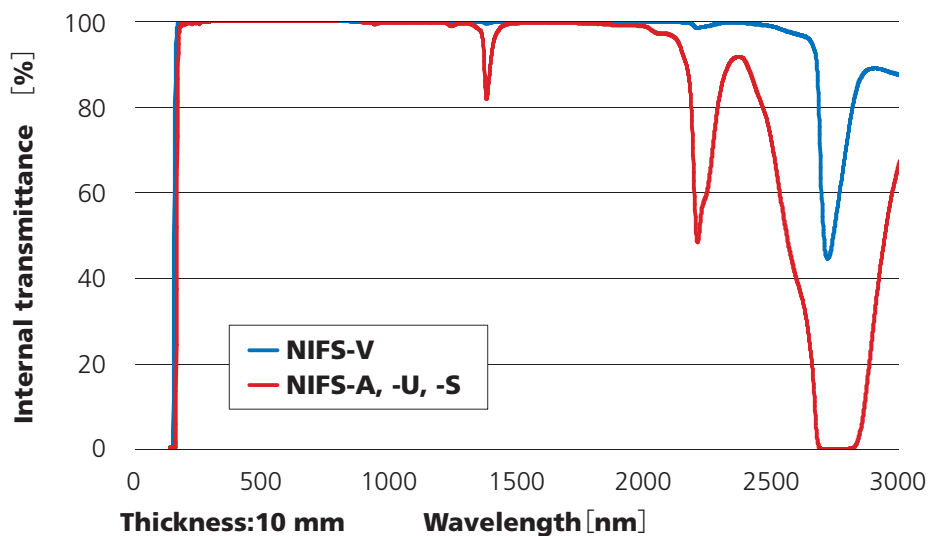


Transmittance data – VUV-VIS-IR region –



Nikon NIFS Series Synthetic Silica Glass

Properties of NIFS-V (Nikon Synthetic Silica Glass)

Refractive Indices

	Wavelength [nm]	Refractive Index
He	1082.989	1.44936
t	1013.98	1.45028
s	852.11	1.45259
A'	768.195	1.45402
r	706.519	1.45527
C	656.273	1.45648
C'	643.847	1.45682
He-Ne	632.8	1.45713
D	589.294	1.45851
d	587.562	1.45857
e	546.074	1.46018
F	486.133	1.46322
F'	479.992	1.46360
g	435.835	1.46678
h	404.656	1.46971
i	365.015	1.47464
KrF	248.3	1.50852
ArF	193.4	1.56021

Measured at
 Temperature : 22.5 °C
 Humidity : 50 %
 Atmospheric pressure : 1013 hPa

Impurities

OH	< 100 ppm
Li	< 0.2 ppb
Na	< 0.2 ppb
K	< 0.2 ppb
Mg	< 0.2 ppb
Ca	< 0.2 ppb
Al	< 0.2 ppb
Ti	< 0.2 ppb
Cr	< 0.2 ppb
Fe	< 0.2 ppb
Cu	< 0.2 ppb

Optical Properties

n_d (He, 587.56 nm)	1.45857
n_e (Hg, 546.07 nm)	1.46018
$n_F - n_C$	0.00674
$n_F - n_C'$	0.00678
γ_d	68.1
γ_e	67.9

Sellmeier Dispersion Equation Constants

B1	0.151370103
B2	0.610890012
B3	0.341550573
B4	0.048272233
C1	0.005303054
C2	0.005304046
C3	0.014019692
C4	6.438755534

Stress Coefficient *	35 nm/cm MPa
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Mechanical Properties

Density	2.2 g/cm ³
Knoop Hardness (100g load)	590 - 610 kg/mm ²
Abrasion **	50
Young's Modulus	73GPa

Thermal Properties

Linear Thermal Expansion Coefficient	100 - 300 °C	5.7 · 10 ⁻⁷ /K
Thermal Conductivity	0 °C	1.3 W/m·K
Mean Heat Capacity *	25 °C	730 J/kg·K

* Excerpts from literature

** Measuring method : JOGIS 10

※We show each property as typical value.

Properties of NIFS-A (Nikon Synthetic Silica Glass)

Refractive Indices

	Wavelength [nm]	Refractive Index
He	1082.989	1.44945
t	1013.98	1.45028
s	852.11	1.45251
A'	768.195	1.45393
r	706.519	1.45519
C	656.273	1.45641
C'	643.847	1.45675
He-Ne	632.8	1.45706
D	589.294	1.45844
d	587.562	1.45850
e	546.074	1.46012
F	486.133	1.46317
F'	479.992	1.46354
g	435.835	1.46674
h	404.656	1.46966
i	365.015	1.47458
KrF	248.3	1.50843
ArF	193.4	1.56017

Measured at
 Temperature : 22.5 °C
 Humidity : 50 %
 Atmospheric pressure : 1013 hPa

Impurities

OH	< 1200 ppm
Li	< 0.2 ppb
Na	< 0.2 ppb
K	< 0.2 ppb
Mg	< 0.2 ppb
Ca	< 0.2 ppb
Al	< 0.2 ppb
Ti	< 0.2 ppb
Cr	< 0.2 ppb
Fe	< 0.2 ppb
Cu	< 0.2 ppb

Optical Properties

n_d (He, 587.56 nm)	1.45850	
n_e (Hg, 546.07 nm)	1.46012	
$n_F - n_C$	0.00676	
$n_F - n_C'$	0.00680	
V_d	67.8	
V_e	67.7	
Thermal Coefficient $\Delta n/\Delta T$ *	Wavelength	dn/dT (K ⁻¹)
		0 - 20 °C 20 - 40 °C
	643.8 nm	9.6×10 ⁻⁶ 9.8×10 ⁻⁶
	587.6 nm	9.8×10 ⁻⁶ 10.0×10 ⁻⁶
	546.1 nm	9.9×10 ⁻⁶ 10.1×10 ⁻⁶
	365 nm	11.0×10 ⁻⁶ 11.2×10 ⁻⁶
	237.8 nm	14.6×10 ⁻⁶ 14.9×10 ⁻⁶
Stress Coefficient *	35 nm/cm MPa	

Mechanical Properties

Density	2.2 g/cm ³
Knoop Hardness (100 g load)	590 - 620 kg/mm ²
Abrasion **	58
Young's Modulus	73 GPa
Shear Modulus	31 GPa
Poisson's Ratio	0.16
Bending Strength	67 MPa

Thermal Properties

Softening Point *	$\log\eta=7.6$	1600 °C
Annealing Point *	$\log\eta=13.0$	1100 °C
Strain Point *	$\log\eta=14.5$	1000 °C
Linear Thermal Expansion Coefficient	100 - 300 °C	5.1 - 5.9 · 10 ⁻⁷ /K
Thermal Conductivity	0 °C	1.4 W/m·K
Mean Heat Capacity *	0 - 100 °C	770 J/kg·K
	0 - 500 °C	960 J/kg·K
	0 - 900 °C	1050 J/kg·K

Dielectric Constant ϵ_r (0 - 1x10 ⁶ Hz) *	20 °C	3.7
$\tan\delta$ *	1 MHz	1.0 x 10 ⁻⁴
Electrical Resistivity *	20 °C	1.0 x 10 ¹⁶ Ω·m

* Excerpts from literature

** Measuring method : JOGIS 10

※We show each property as typical value.

Nikon NIFS Series Synthetic Silica Glass

Properties of NIFS-U (Nikon Synthetic Silica Glass)

Refractive Indices

	Wavelength [nm]	Refractive Index
He	1082.989	1.44945
t	1013.98	1.45028
s	852.11	1.45251
A'	768.195	1.45393
r	706.519	1.45519
C	656.273	1.45641
C'	643.847	1.45675
He-Ne	632.8	1.45706
D	589.294	1.45844
d	587.562	1.45850
e	546.074	1.46012
F	486.133	1.46317
F'	479.992	1.46354
g	435.835	1.46674
h	404.656	1.46966
i	365.015	1.47458
KrF	248.3	1.50843
ArF	193.4	1.56017

Measured at
 Temperature : 22.5 °C
 Humidity : 50 %
 Atmospheric pressure : 1013 hPa

Impurities

OH	< 1200 ppm
Li	< 50 ppb
Na	< 50 ppb
K	< 50 ppb
Mg	< 50 ppb
Ca	< 50 ppb
Al	< 50 ppb
Ti	< 50 ppb
Cr	< 50 ppb
Fe	< 50 ppb
Cu	< 50 ppb

Optical Properties

n_d (He, 587.56 nm)	1.45850		
n_e (Hg, 546.07 nm)	1.46012		
$n_F - n_C$	0.00676		
$n_{F'} - n_{C'}$	0.00680		
V_d	67.8		
V_e	67.7		
Thermal Coefficient $\Delta n/\Delta T$ *	Wavelength	dn/dT (K ⁻¹)	
		0 - 20 °C	20 - 40 °C
	643.8 nm	9.6×10^{-6}	9.8×10^{-6}
	587.6 nm	9.8×10^{-6}	10.0×10^{-6}
	546.1 nm	9.9×10^{-6}	10.1×10^{-6}
	365 nm	11.0×10^{-6}	11.2×10^{-6}
237.8 nm	14.6×10^{-6}	14.9×10^{-6}	
Stress Coefficient *	35 nm/cm MPa		

Mechanical Properties

Density	2.2 g/cm ³
Knoop Hardness (100 g load)	590 - 620 kg/mm ²
Abrasion **	58
Young's Modulus	73 GPa
Shear Modulus	31 GPa
Poisson's Ratio	0.16
Bending Strength	67 MPa

Thermal Properties

Softening Point *	$\log \eta = 7.6$	1600 °C
Annealing Point *	$\log \eta = 13.0$	1100 °C
Strain Point *	$\log \eta = 14.5$	1000 °C
Linear Thermal Expansion Coefficient	100 - 300 °C	$5.1 - 5.9 \cdot 10^{-7}/K$
Thermal Conductivity	0 °C	1.4 W/m·K
Mean Heat Capacity *	0 - 100 °C	770 J/kg·K
	0 - 500 °C	960 J/kg·K
	0 - 900 °C	1050 J/kg·K

Dielectric Constant ϵ_i (0 - 1×10^6 Hz) *	20 °C	3.7
$\tan \delta$ *	1 MHz	1.0×10^{-4}
Electrical Resistivity *	20 °C	$1.0 \times 10^{16} \Omega \cdot m$

* Excerpts from literature

** Measuring method : JOGIS 10

※We show each property as typical value.

Properties of NIFS-S (Nikon Synthetic Silica Glass)

Refractive Indices

	Wavelength [nm]	Refractive Index
He	1082.989	1.44945
t	1013.98	1.45028
s	852.11	1.45251
A'	768.195	1.45393
r	706.519	1.45519
C	656.273	1.45641
C'	643.847	1.45675
He-Ne	632.8	1.45706
D	589.294	1.45844
d	587.562	1.45850
e	546.074	1.46012
F	486.133	1.46317
F'	479.992	1.46354
g	435.835	1.46674
h	404.656	1.46966
i	365.015	1.47458
KrF	248.3	1.50843
ArF	193.4	1.56017

Measured at
 Temperature : 22.5 °C
 Humidity : 50 %
 Atmospheric pressure : 1013 hPa

Impurities

OH	< 1200 ppm
Li	< 100 ppb
Na	< 100 ppb
K	< 100 ppb
Mg	< 100 ppb
Ca	< 100 ppb
Al	< 100 ppb
Ti	< 100 ppb
Cr	< 100 ppb
Fe	< 100 ppb
Cu	< 100 ppb

Optical Properties

n_d (He, 587.56 nm)	1.45850		
n_e (Hg, 546.07 nm)	1.46012		
$n_F - n_C$	0.00676		
$n_F - n_C'$	0.00680		
V_d	67.8		
V_e	67.7		
Thermal Coefficient $\Delta n/\Delta T$ *	Wavelength	dn/dT (K ⁻¹)	
		0 - 20 °C	20 - 40 °C
	643.8 nm	9.6×10^{-6}	9.8×10^{-6}
	587.6 nm	9.8×10^{-6}	10.0×10^{-6}
	546.1 nm	9.9×10^{-6}	10.1×10^{-6}
365 nm	11.0×10^{-6}	11.2×10^{-6}	
237.8 nm	14.6×10^{-6}	14.9×10^{-6}	
Stress Coefficient *	35 nm/cm MPa		

Mechanical Properties

Density	2.2 g/cm ³
Knoop Hardness (100 g load)	590 - 620 kg/mm ²
Abrasion **	58
Young's Modulus	73 GPa
Shear Modulus	31 GPa
Poisson's Ratio	0.16
Bending Strength	67 MPa

Thermal Properties

Softening Point *	$\log \eta = 7.6$	1600 °C
Annealing Point *	$\log \eta = 13.0$	1100 °C
Strain Point *	$\log \eta = 14.5$	1000 °C
Linear Thermal Expansion Coefficient	100 - 300 °C	$5.1 - 5.9 \cdot 10^{-7}/K$
Thermal Conductivity	0 °C	1.4 W/m·K
Mean Heat Capacity *	0 - 100 °C	770 J/kg·K
	0 - 500 °C	960 J/kg·K
	0 - 900 °C	1050 J/kg·K

Dielectric Constant ϵ_r (0 - 1×10^6 Hz) *	20 °C	3.7
$\tan \delta$ *	1 MHz	1.0×10^{-4}
Electrical Resistivity *	20 °C	$1.0 \times 10^{16} \Omega \cdot m$

* Excerpts from literature

** Measuring method : JOGIS 10

※We show each property as typical value.



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