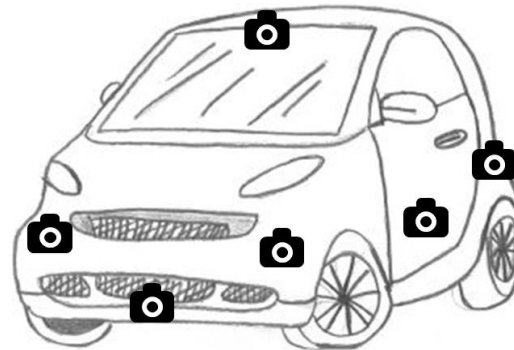


Information on newly developed glass-types for automotive cameras

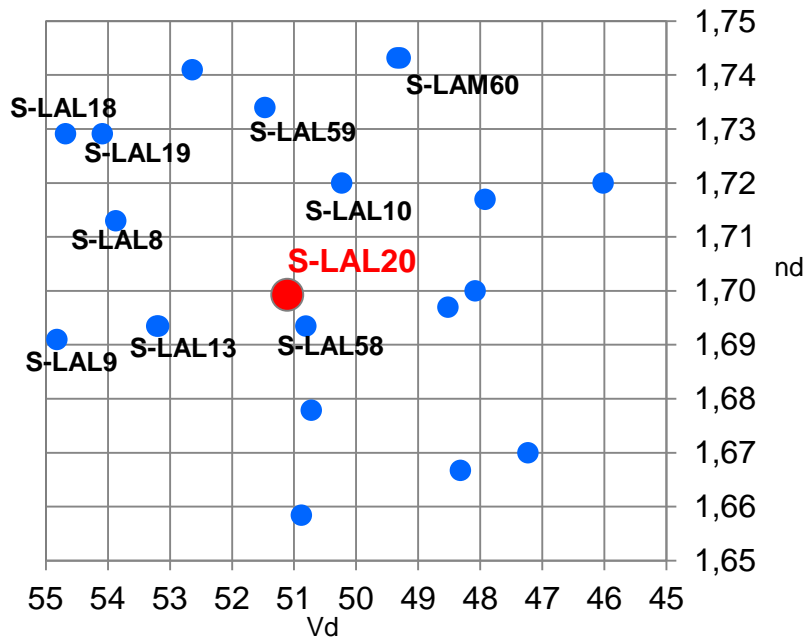
Automotive cameras are installed in various places inside and outside cars. They are subjected to various external influences.



External influences	Properties of optical glass
Acid rain	Water and acid resistance
Stepping stones and dust	Hardness and abrasion
Temperature changes	Expansion coefficient (Thermal shock resistance) Temperature coefficient of refractive index, dn/dT

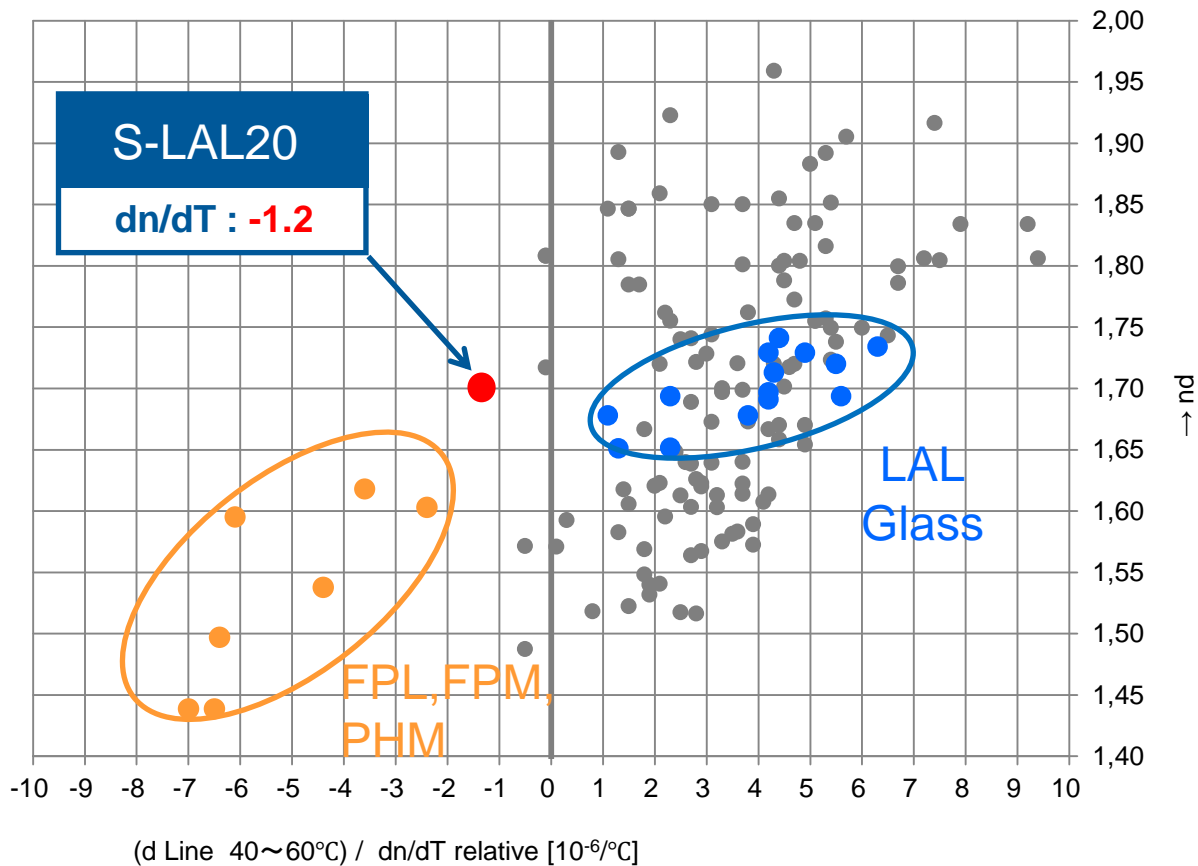
New Glass S-LAL20

- Negative dn/dT at LAL area
Adjustment of temperature drift
- Larger CTE
Advantageous for cementing fluorophosphate glass



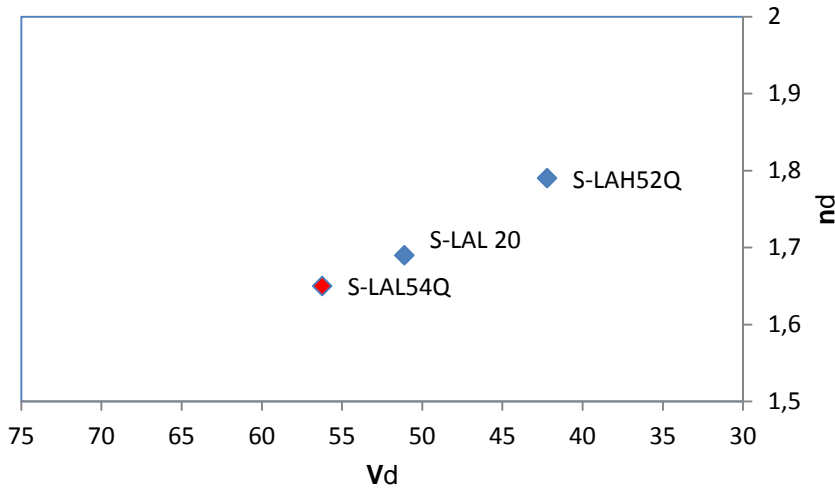
Values	S-LAL20	S-LAL58
Nd	1.69930	1.69350
Vd	51.11	50.81
$\theta_{g'F}$	0.5552	0.5546
$\Delta\theta_{g'F}$	-0.0036	-0.0047
dn/dT (d line40°C~60°C)	-1,2	2.3
CTE -30 ~ 70°C	90	75
CTE +100~300°C	105	86
Tg (°C)	628	676
At (°C)	676	718
Coloring λ_{80} (λ_{70})	(370)	370
Coloring λ_5	310	320
Water Resistance (RW)	2	1
Acid Resistance (RA)	4	4
Weathering Resistance (W)	-	3
Acid Resistance (SR)	53.1	52.2
Phosphate Resistance (PR)	4.2	2.2
Density (d)	4.38	4.03
Knoop Hardness (Hk)	490[5]	580[6]
Abrasion (Aa)	243	167

S-LAL20: Negative dn/dT



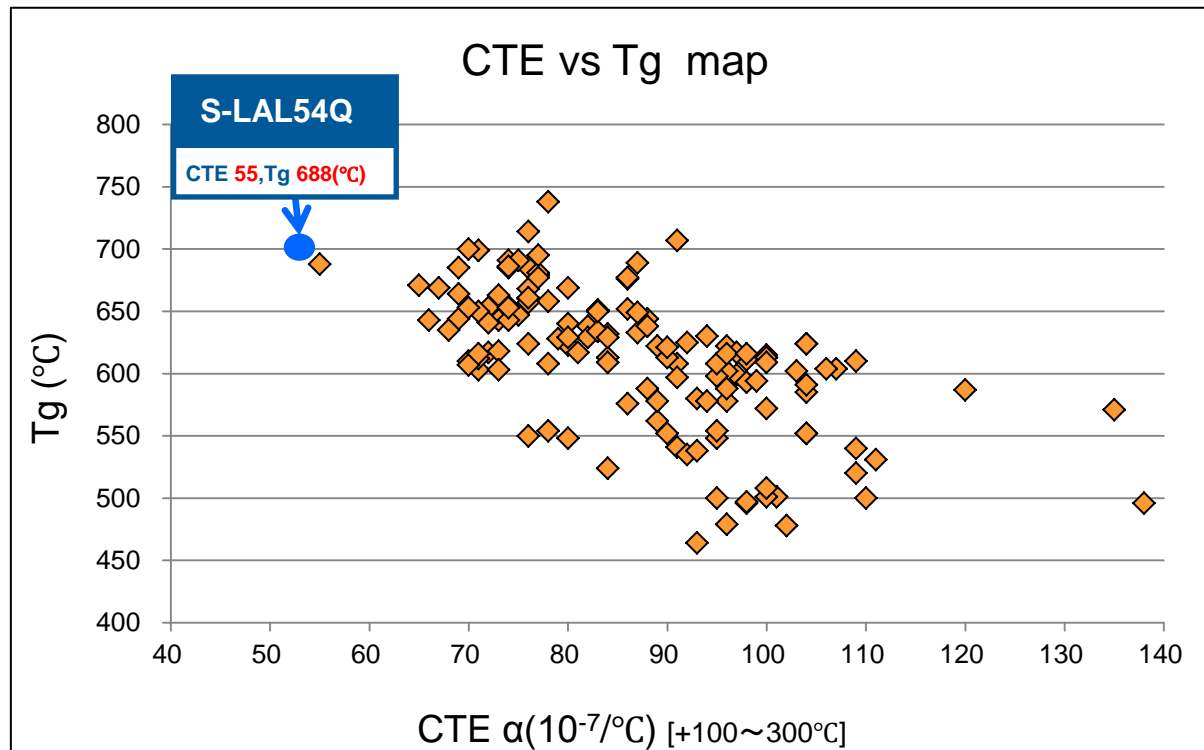
New Glass S-LAL54Q

- Improvement of chemical durability
 - RA(P): Class3, RW(P): Class 1
- High Mechanical Strength
 - Knoop hardness 680 (Class7)
 - Abrasion 53
 - Stronger anti-crack and impact resistance
- Small CTE
 - Smallest CTE among OHARA optical glass
 - Stronger resistance to thermal shock
- Low density
- Equivalent to S-LAL54 (nd,Vd)



Values	S-LAL54Q	S-LAL54
Nd	1.65100	1.65100
Vd	56.24	56.16
$\theta_{g'F}$	0.5420	0.5482
$\Delta\theta_{g'F}$	-0.0085	-0.0024
CTE -30 ~ 70°C	43	71
CTE +100~300°C	55	83
Tg (°C)	688	651
At (°C)	718	675
Coloring $\lambda 80$ ($\lambda 70$)	385	365
Coloring $\lambda 5$	315	325
Water Resistance (RW)	1	3
Acid Resistance (RA)	3	5
Weathering Resistance (W)	2	3
Acid Resistance (SR)	4.0	53.0
Phosphate Resistance (PR)	3.0	4.2
Density (d)	3.36	3.82
Knoop Hardness (Hk)	680 [7]	530[5]
Abrasion (Aa)	53	171

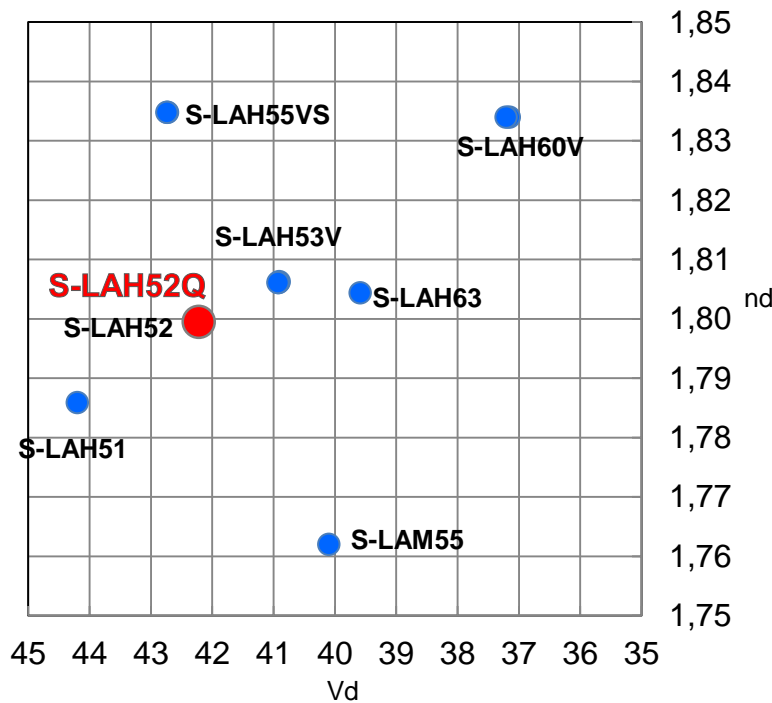
S-LAL54Q Low expansion characteristic



It has the lowest CTE among OHARA optical glasses, has a high Tg and is suitable for optical systems under environments where the temperature change is very large.

New Glass S-LAH52Q

- The largest dn/dT among OHARA glasses
→ Correction of temperature drift of glass types with negative dn/dT
- Equivalent to S-LAH52 (nd, Vd)



Values	S-LAH52Q	S-LAH52
Nd	1.79952	1.79952
Vd	42.2	42.22
dn/dt (d line 40°C~60°C)	10.3	6.7
CTE -30 ~ 70°C	-	60
CTE +100~300°C	72	73
Tg (°C)	597	618
At (°C)	627	636
Coloring λ_{80} (λ_{70})	390	400
Coloring λ_5	340	330
Water Resistance (RW)	1	1
Acid Resistance (RA)	3	4 → 3
Weathering Resistance (W)	.	1
Acid Resistance (SR)	.	51.2
Phosphate Resistance (PR)	.	2.0
Density (d)	4.47	4.41
Knoop Hardness (Hk)	620[6]	640[6]
Abrasion (Aa)	-	82

S-LAH52Q Unique dn/dT

