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FARADAY ROTATOR GLASSES

Since glass material in high power laser system is damaged as a consequence of self-focusing, low nonlinear refractive index n_2 as well as high Verdet constant V are important factors for Faraday rotator glass.

Faraday rotator glasses have been developed by HOYA CORPORATION. The properties of these glasses are shown in Table 1. FR-5 has highest Verdet constant and, as a result, highest figure of merit. FR-4 is characterized by lower n_2 than FR-5.

Table 1 The Properties of HOYA Faraday Rotator Glasses

		FR-4	FR-5
Verdet constant V (min/Oe-cm)	632.8nm	−0.090	−0.242
	1060 nm	−0.026	−0.071
Refractive indices	n_d	1.57316	1.68832
	n_C	1.57018	1.68445
	n_F	1.58006	1.69730
Abbe number	ν_d	58.01	53.56
Non-linear index n_2 (10^{-13} e.s.u.)		1.59	2.45
Figure of merit V_{633} (n_d/n_2)		0.089	0.167
Density (g/cm^3)		3.10	4.28
Transformation temp T_g (°C)		625	756
Sag temperature T_S (°C)		654	801
Coeff. of linear thermal expansion	$\alpha_{100-300°C}$ (10^{-7}/°C)	67	50
	$\alpha_{20-40°C}$ (10^{-7}/°C)	63	47
	$\alpha_{30-70°C}$ (10^{-7}/°C)	61	44
Knoop hardness H_K (kgf/mm^2)		(510)	745
Chemical properties (wt. loss %)	D_W (H_2O 100°C 1 hr)	0.015	0.013
	D_A (0.01N-HNO_3 100°C 1 hr)	0.055	0.22
Young's modulus Y (kgf/mm^2)		6651	11035
Modulus of Rigidity G (kgf/mm^2)		2673	4517
Poisson's ratio		0.244	0.22
dn/dT (10^{-6}/°C) (20—40°C)		+2.8	+7.5
ds/dT (10^{-6}/°C) (20—40°C)		+6.3	+10.7