Reverse Engineering 이용하여 Multilayer에서 특정 Layer 물질의 광학 상수 구하기

코팅 구조

Layer 1 : 물질 Data 유 Layer 2 : 물질 Data 무 (물질 data를 모름) Layer 3 : 물질 Data 유

Layer 2의 물질 이름 생성

광학 상수를 구할 Material 생성



등록확인

🚯 Materials		
Wavelength	(nm) <mark>510.00</mark>	
Material	Refractive Index	Extinction Coefficient
Air	1.00000	0.00000
Glass	1.52083	0.00000
Na3AlF6	1.35000	0.00000
MgF2	1.38542	0.00000
Si02	1.46180	0.00000
Ta205	2.14455	0.00000
Y203	1.79581	0.00009
Ti02	2.34867	0.00037
AI	0.70000	5.66333
HfO2	1.93940	0.00000
Ag	0.05100	2.96000
Zr02	2.06577	0.00004
Al203	1.66574	0.00000
rematnk	1.00000	0.00000

Design File 생성 (retest1.dds)

b -1	retest1									
<u>D</u> e:	sign <u>C</u> or	ntext <u>N</u> otes	<u>) </u>							
Inci	dent Angle	(deg)	0.00							
Ref	erence Wa	velength (nm)	510.0)0						
	Layer Material			Refractive Index	Extinction Coefficient	Optical Thickness (FWOT)	Physical Thickness (nm)			
	Medium	Air		1.00000	0.00000					
	1	Ta205		2.14455	0.00000	0.12614979	30.00			
	2	rematnk		1.00000	0.00000	0.03921569	20.00			
	3	SiO2		1.46180	0.00000	0.08598837	30.00			
	Substrate	Glass		1.52083	0.00000					



측정된 목표 Data File 준비 (retest1.csv)

Wavelength (nm)	Reflectance (%)	Transmittance (%)	F
400	34.878302	64.919829	
420	35.065773	64.808702	
440	34.843154	65.084967	
460	34.365641	65.577541	
480	33.731688	66.213395	
500	32.972762	66.994648	
520	32.1 <mark>1</mark> 3032	67.865531	
540	31.185957	68.799931	
560	30.244731	69.746973	
580	29.254053	70.743172	
600	28.258795	71.741205	
620	27.26939	72.726353	
640	26.310733	73.677826	
660	25.376229	74.607958	
680	24.460886	75.520447	
700	23.586296	76.396121	

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Keverse	Engineer				×		
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Enter the r Substrate	material used for th is not Lossless. Al	he substrate and its thic so specify the medium ir	kness. The Substrate which the measurer	Thickness is only importan nent was taken.	t when the		
Substra Mea	<u>S</u> ubstrate Materia ite <u>T</u> hickness (mm asurement <u>M</u> ediun	al Glass) 1.000 n Air	×				
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*					Wavelength (nm),Reflectance (%),Tran	smittance (%),Reflectance-Pha	se (deg),Trans
타일 이름(N):	retest1			✓ all files (*.*) 열기(O)	400, 34.873017653243, 64.3138294 420, 35.0657728282782, 64.8087020 440, 34.843153607003, 65.0849669 460, 34.3656410649319, 65.5775412 480, 33.7316884909034, 66.2133952 500, 32.9727619110487, 66.9946481 520, 32.1130322475063, 67.8655307 540, 31.1859572118021, 68.7999309 560, 30.2447306489725, 69.7469733 580, 29.2540530833241, 70.7431721 600, 28.2587350191826, 71.7412049 620, 27.2693903660238, 72.72635316 640, 26.3107333860518, 73.67782566	02082, 162.101177994615, 13 i26371, 167.306732428668, 14 i7494, 171.662480308619, 15 i37602, 178.541548188739, 17 i12599,178.534347221381, 17 i12599,178.534347221381, 17 i48209,173.566233020084,16 i82404,171.46174116288,166 i2635,169.53018594928,157 i2635,169.53018594928,157 i36175,167.778022467135,16 i574651,166.187966169269,14 i47464,164.746612887204,14	11 213959359 42 931621552 33 218956771 32 286348257 70 334503047 77.75015112 75.445718094 39.184487366 3.3950849377 98305714368 2.929246359 18.190253520 13.742791927
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Х

Design 파일과 측정된 Data의 그래프가 보임

🞽 retest1 <de></de>		- 0 🔀
RMS Difference: 20.97		
Design 1: Transmittan	ce	
🔽 Show Use Points		
F Show Ignored Points	I Show Adjusted Design Polarization P ▼ Substrate Type Parallel ▼	
Transmittance	s (%)	
¹⁰⁰ I		
90		
80		
70	×××××××	
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400	500 600	700
	Wavelength (nm)	
	× Use Points ——— Adjusted Measurement —— Adjusted Design	
Use Points Igno	ore Points Use <u>All Points</u> Ignore All Points Use Interval 1	



Layer 2에 관련된 모든 Action을 Adjust 변경

ſ	\mathbf{z}	Reverse Engineer Pa	arameters						
\mathbf{I}	Ma	aterial Layer Spectr	um M <u>a</u> terial Mod	els <u>H</u> istory					
I		Material	Thickness Action	Order	Density Action	Order	Inhomogeneity Action	Order	Adjust
		Ta205	Not Used	Constant	Not Used	Constant	Not Used	Constant	Church
	▶	rematnk	Adjust	Constant	Adjust	Constant	Adjust	Constant	Liose
T		5102	Not Used	Constant	Not Used	Constant	Not Used	Constant	
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	<u> </u>	Revers	e Engineer Paran	neters		
	<u>M</u> at	erial	Layer Spectrum	Material Models	History	
l		Layer	Thickness Action	Density Action	Inhomogeneity Action	Adjust
		1	Not Used	Not Used	Not Used	Church
	▶	2	Adjust	Adjust	Adjust	
1		3	Not Used	Not Used	Not Used	
		All				

~	Reverse Engineer Pa	arameters				
<u>M</u> a	terial Layer Spectr	um Material Models History				
	Material	Script Name	Action	Parameters	Material	Adjust
	Ta205		Not Used	Show	Create	Claus
▶	rematnk 📼	<internal></internal>	Adjust	Show	Create	Llose
	SiO2		Not Used	Show	Create	
	All					

-	Reverse Engineer Parameters									
<u>M</u> a	iterial <u>L</u> ayer <u>S</u> pectr	um Material Models History								
Γ	Material	Script Name	Action	Parameters	Material	Adjust				
	Ta205		Not Used	Show	Create	Church				
▶	rematnk 🖃	<internal></internal>	Adjust	Show	Create	Liose				
	SiO2		Not Used	Show	Create					
	All									
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Adjust 실행

🞽 retest1 <de></de>			
RMS Difference: 40.549	Range: 0.60839		
Design] 1: Transmittanc	,		
Show Use Points	Show Adjusted Measurements	Incident Angle (deg)	Cone Angle 0.00
Show Ignored Points	Show Adjusted Design	Polarization P 💌	Substrate Type Parallel

Adjust 완료

retest1 <de></de>				
RMS Difference: 40.49				
Design] <u>1</u> : Transmittan	ce			
Show Use Points	Show Adjusted Measurements	Incident Angle (deg) 0.00	Cone Angle 0.00	
Show Ignored Points	✓ Show Adjusted Design	Polarization P	Substrate Type Parallel	•
Transmittance	(%)			
100				

측정돤 Data로 Adjust된 설계 완성



			<u>•</u>	Defeetive	Futination	Ostical	Physical	Adjusted	Adjusted	Systematic	Systematic	Systematic	Random	Random	Dandara
	Туре	Layer	Material	Index	Coefficient	Thickness	Thickness (nm)	Optical Thickness	Physical Thickness (nm)	Thickness Change (%)	Density Change	Înhomo- geneity	Thickness Change (%)	Density Change	Inhomo-gene
		Medium Air	205	2 14455	0.00000	0.08409986	20.00	0.08409986	20.00	0.00%	0 0000	0 0000	0.00%	0 0000	0.00
		2 ren	natnk	2.00000	0.00000	0.11764706	30.00	0.11201549	24.70	-1.00%	0.0021	-0.0080	-16.67%	0.1917	0.0
\vdash		3 Si0 Substrate Gla	12	1.46180	0.00000	0.27070411	94.44	0.27070411	94.44	0.00%	0.0000	0.0000	0.00%	0.0000	0.0
		Medium Air													
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t Angle nce Wa	(deg) aveleng	0.0 th (nm) 51	00 0.00				T):	Designs	(*.dds)						
edium	Laye	Packing Density	Materia	I R	efractive Index	Extinction Coefficient	Optical Thicknes (FWOT)	s Phys Thick	sical Mi ness Thi m) (edium ckness (mm)	Inhom geneity Fa	o- actor	새로	운 이	름의
Туре	- 11 - 11 - 11 - 11 - 11 - 11 - 11 - 1		Alf T-205		2.14455	0.0000	0.094099	200	20.00		1	0	rema	ntnk(F	RE 1)
Type idenl 🖵		1 00000					0.440045		0.4.70						,
Type iden I	Г	1.19373	rematnk (RE	1)	2.31287	0.0000	0.112015	549	24.70		-0.	00413	물실	생성	
Type ident -	E	1.00000 2 1.19373 2 1.00000	rematnk (RE SiO2 Glass	1)	2.31287 1.46199 1.52082	0.0000	0.112018	11	24.70 94.44	1.000	-0.	00413	불실	생성	

RMS Difference: 0.82228

새로운 Material로 저장됨

options Help					
Materials					
Browse Materials Library Browse Online Materials Library					
Load ZEMAX Coating File New ZEMAX Coating File	🚯 Materials				
Substrate n,k & T	Wavelength (r	Wavelength (nm) <mark>510.00</mark>			
DWDM Assistant	Material	Refractive Index	Extinction Coefficient		
Scrints	Air	1.00000	0.0000		
Scripts	Glass	1.52083	0.0000		
	Na3AIF6	1.35000	0.0000		
	MgF2	1.38542	0.0000		
	SiO2	1.46180	0.0000		
	Ta205	2.14455	0.0000		
	Y203	1.79581	0.0000		
	TiO2	2.34867	0.00037		
	Al	0.70000	5.66333		
	HfO2	1.93940	0.0000		
	Ag	0.05100	2.9600		
	Zr02	2.06577	0.00004		
	AI203	1.66574	0.0000		
	rematnk	2.00000	0.00000		
	SiO2(1)	1.46180	0.0000		
	Glass(1)	1.52083	0.00000		
	SiO2(2)	1.46180	0.0000		
	Glass(2)	1.52083	0.0000		
	rematnk (RE 1)	2.09981	0.00000		
	J	+ +			