

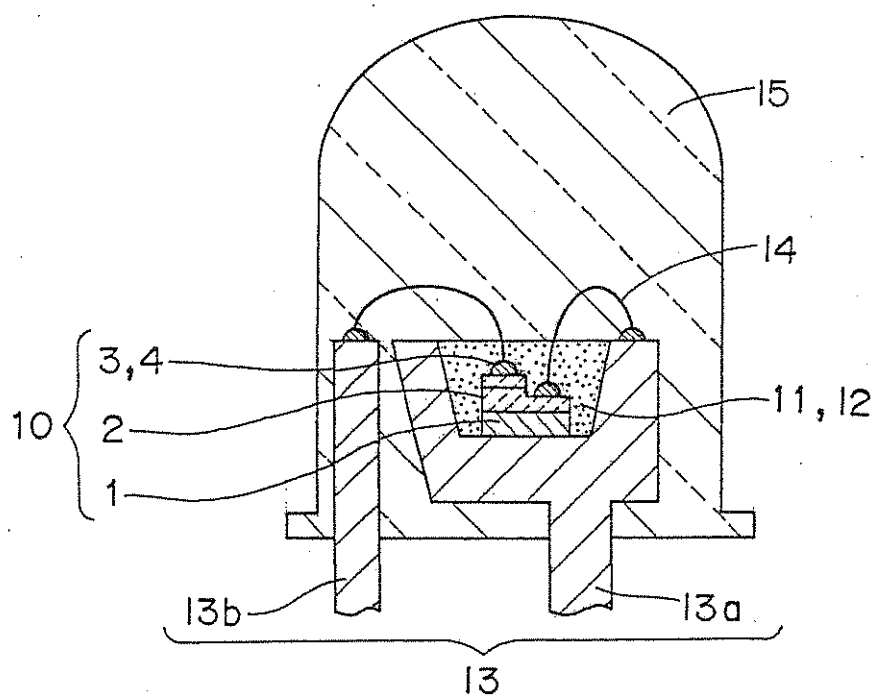
Fig. 1

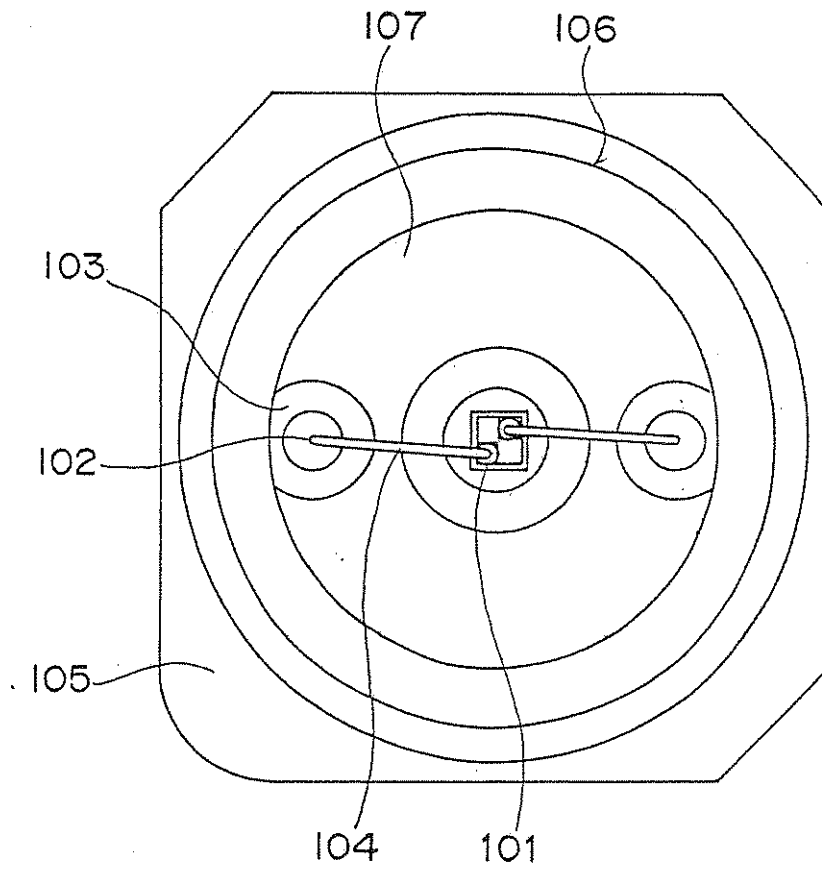
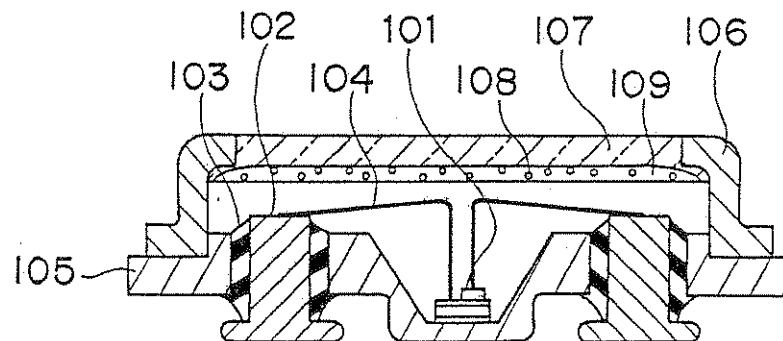
Fig. 2A*Fig. 2B*

Fig.3

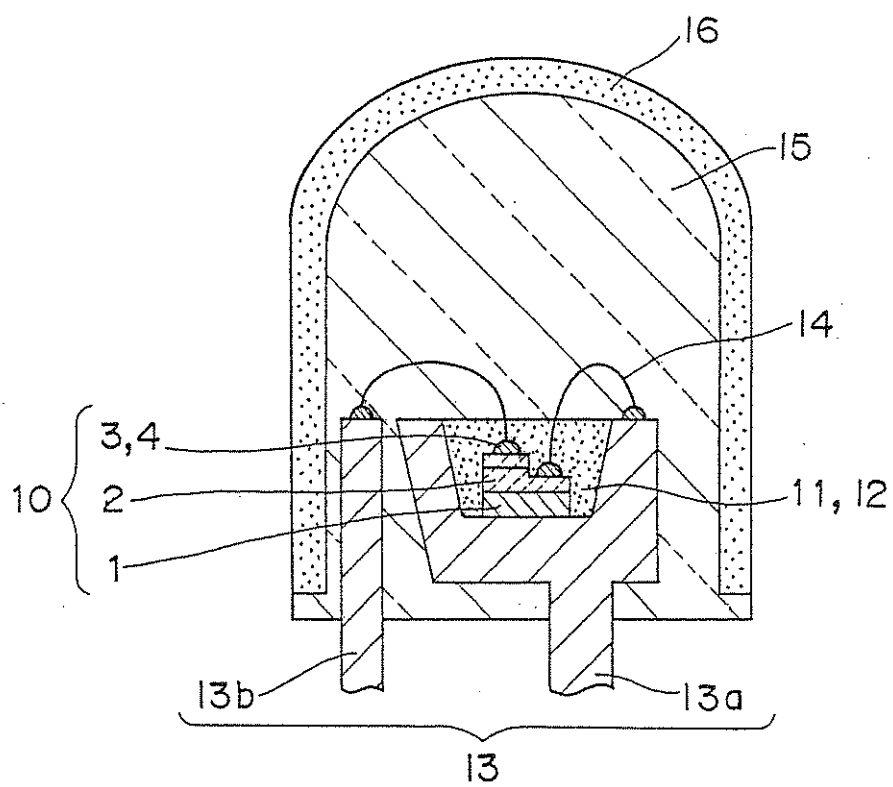


Fig. 4

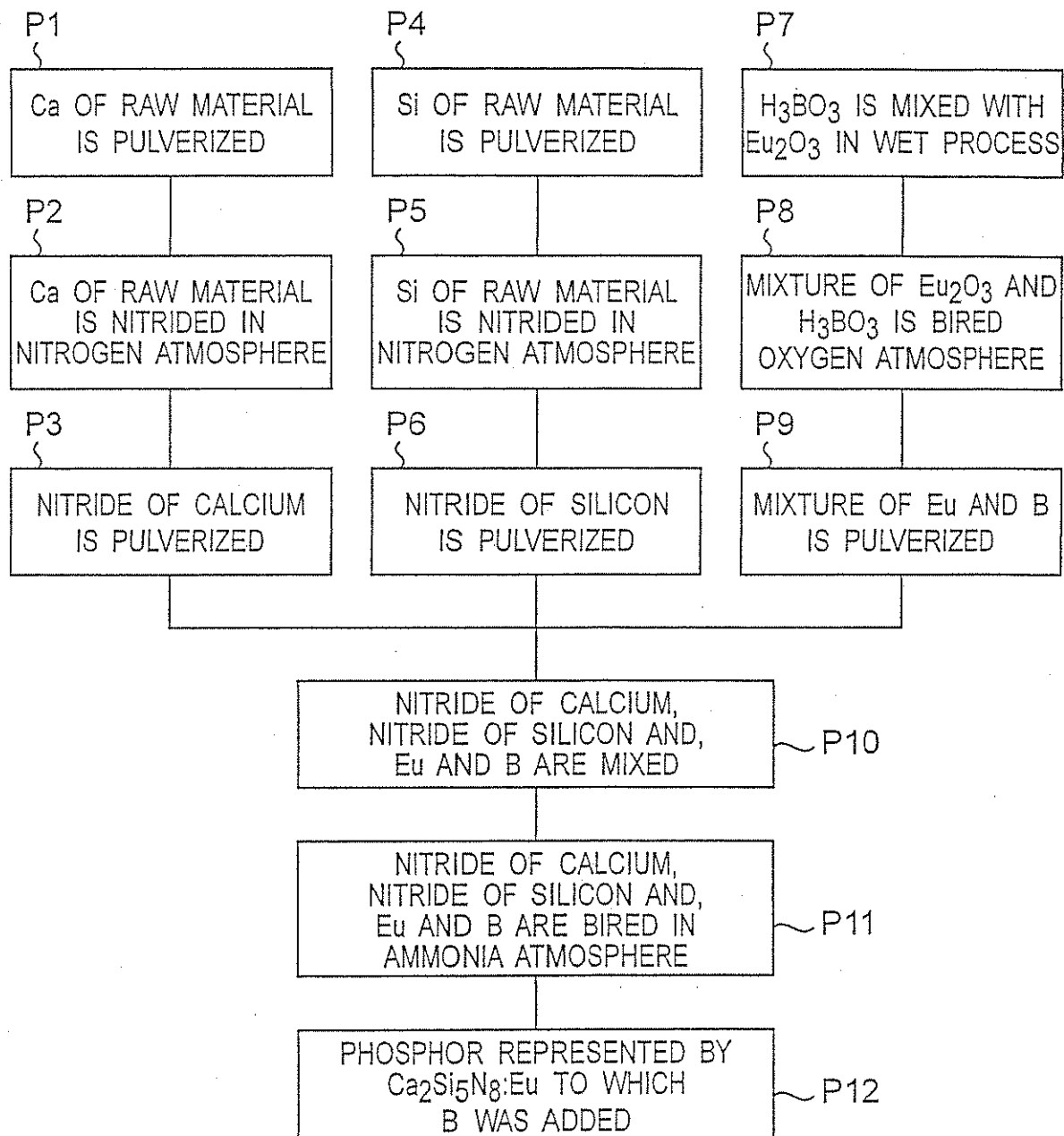
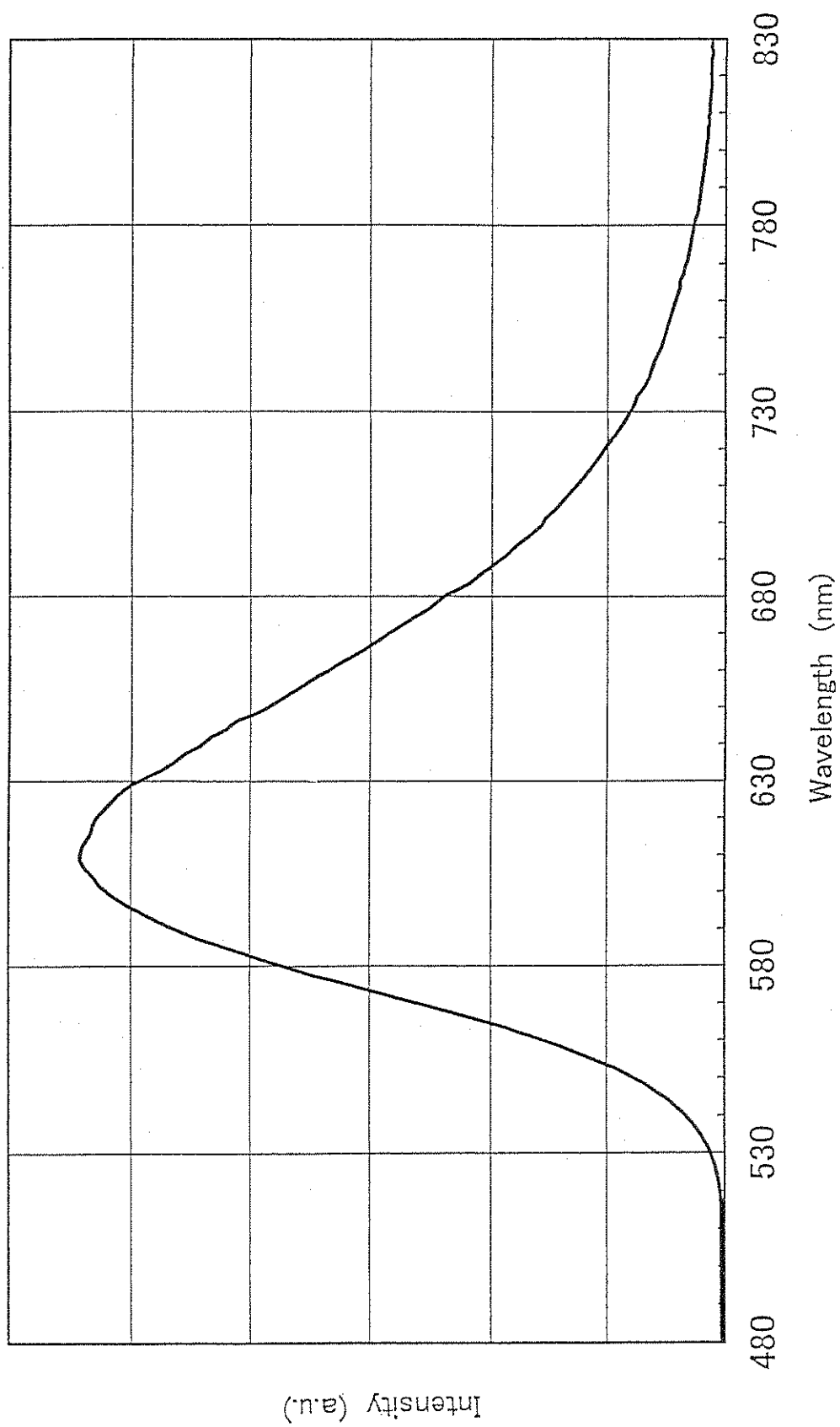
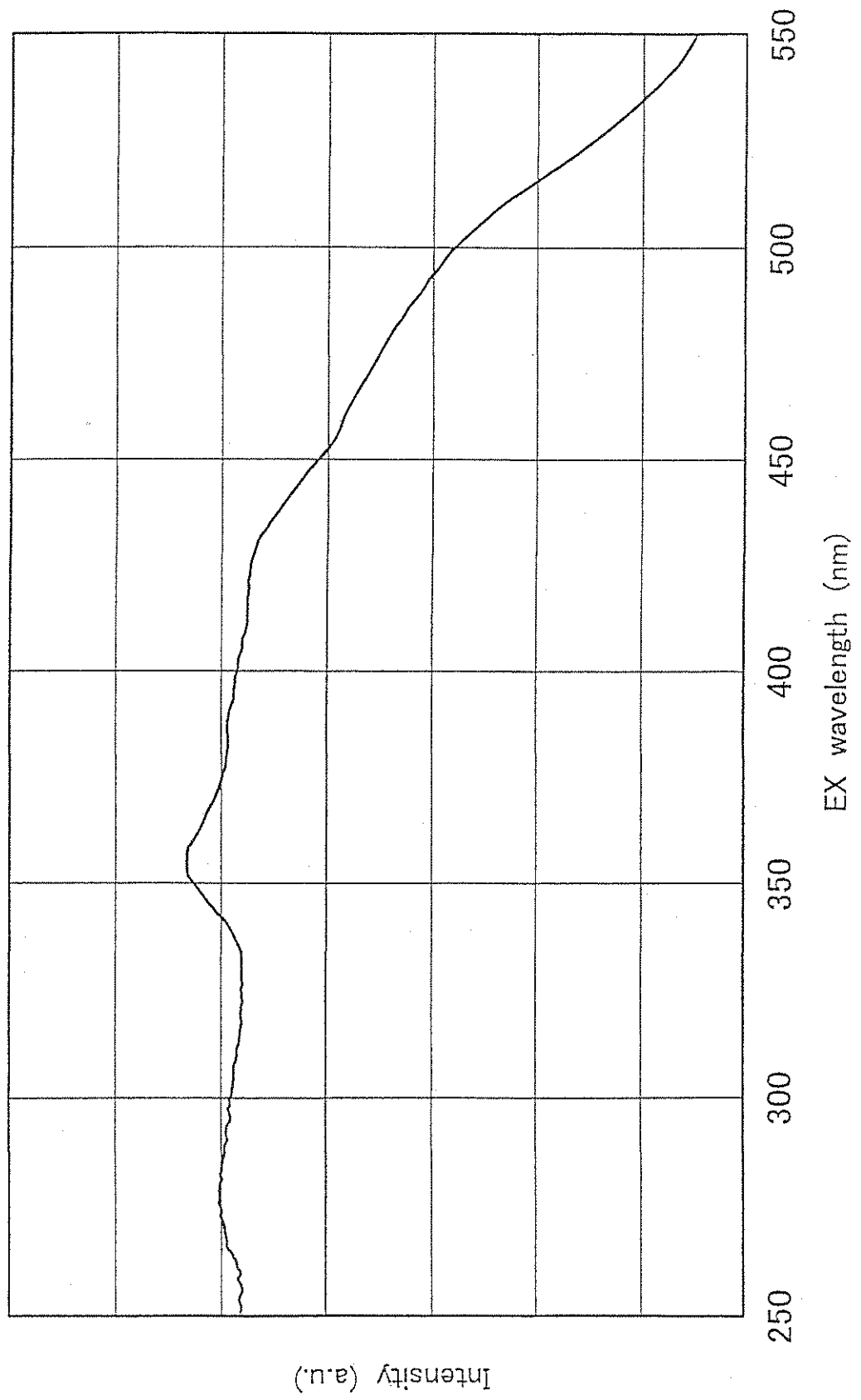


Fig. 5
Emission spectrum (EX=460nm)



Excitation spectrum

Fig. 6



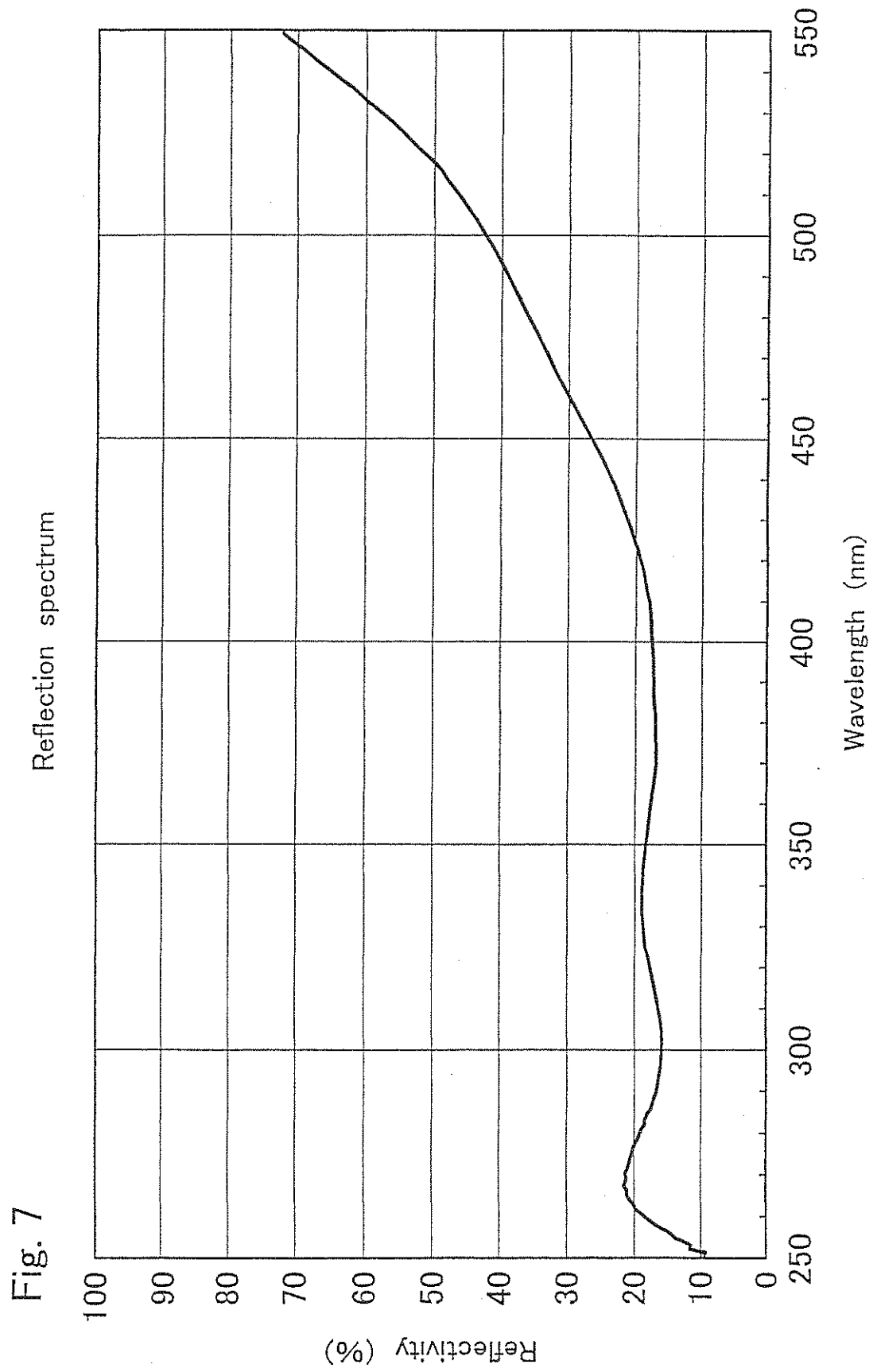
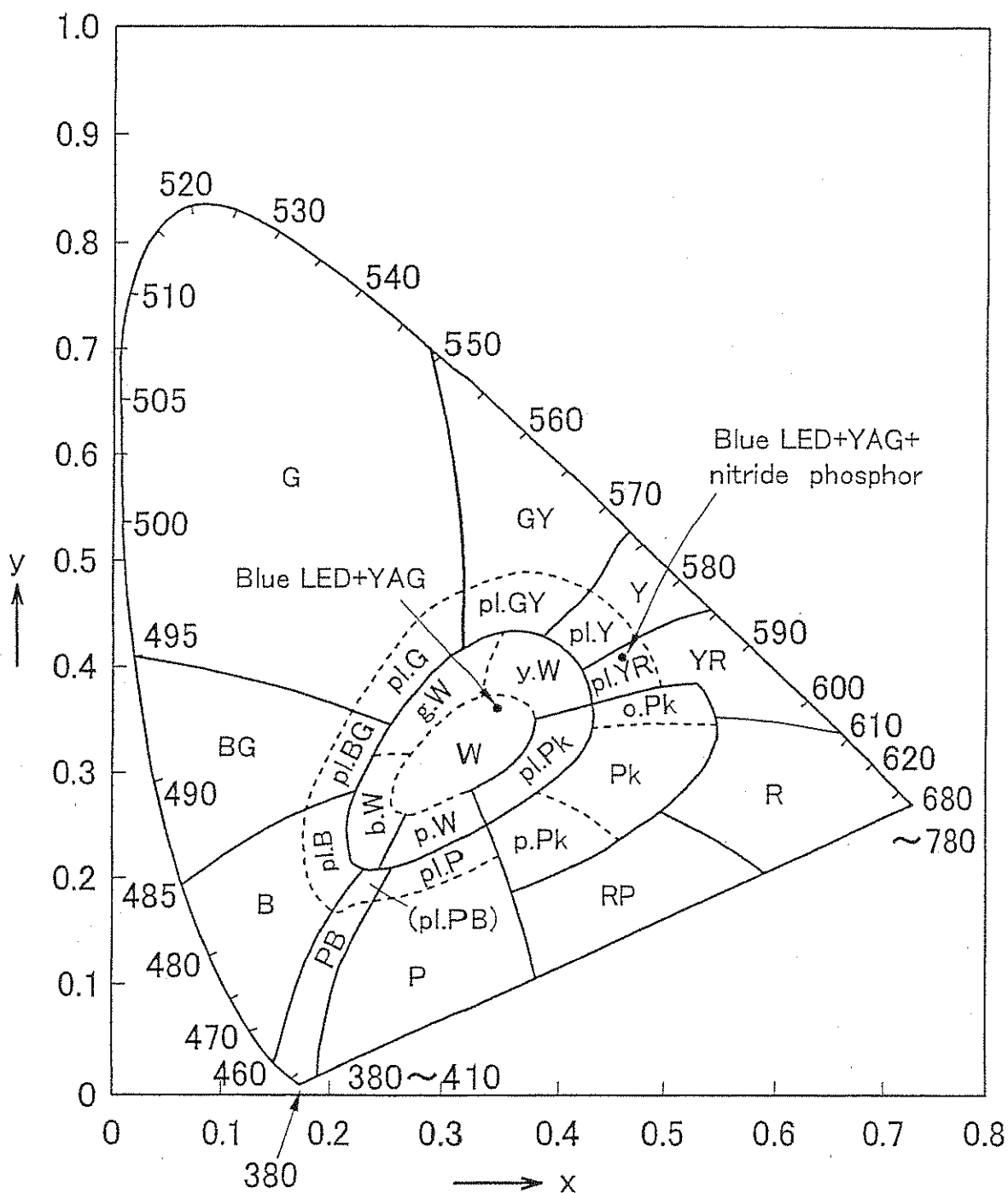


Fig. 8

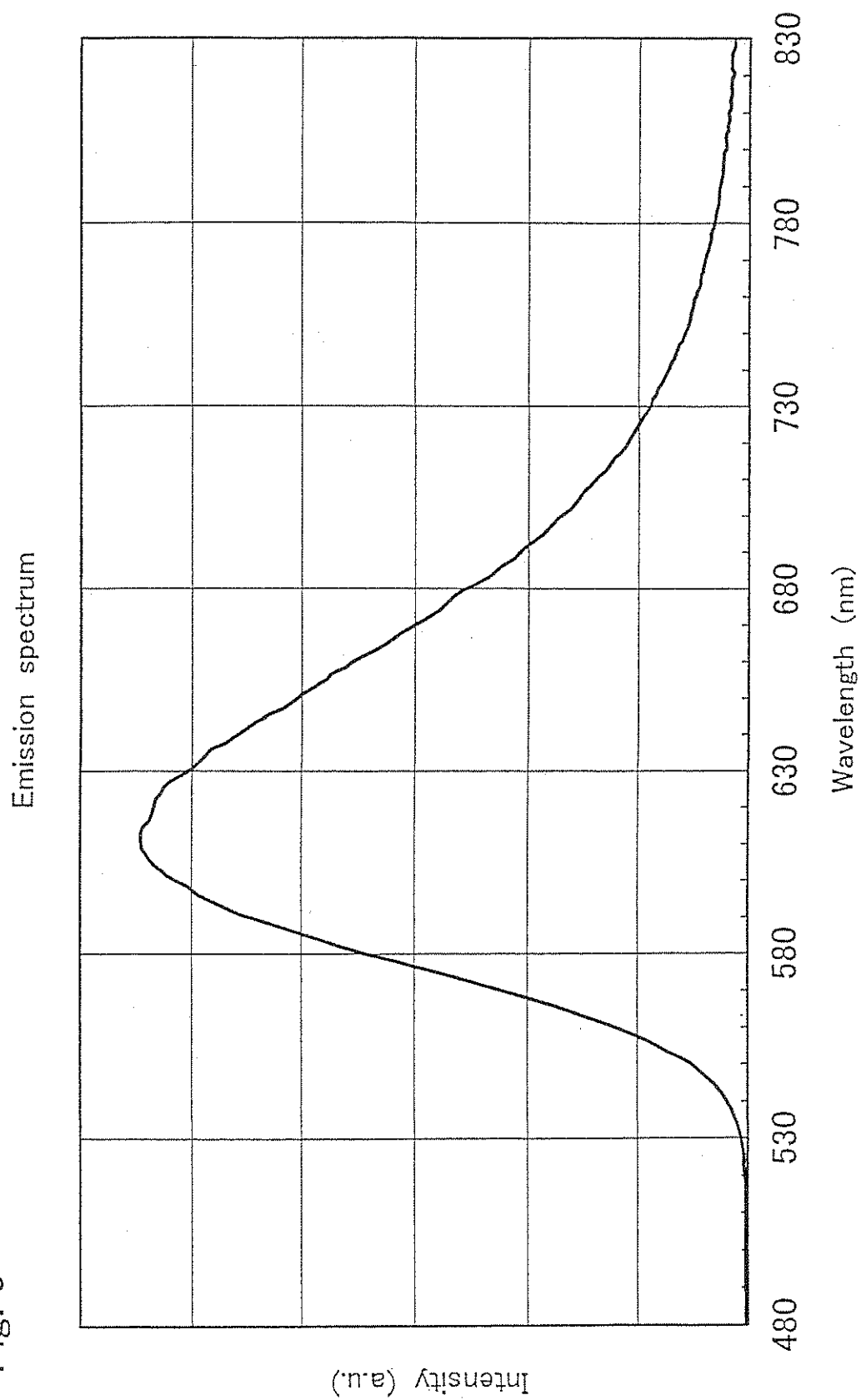


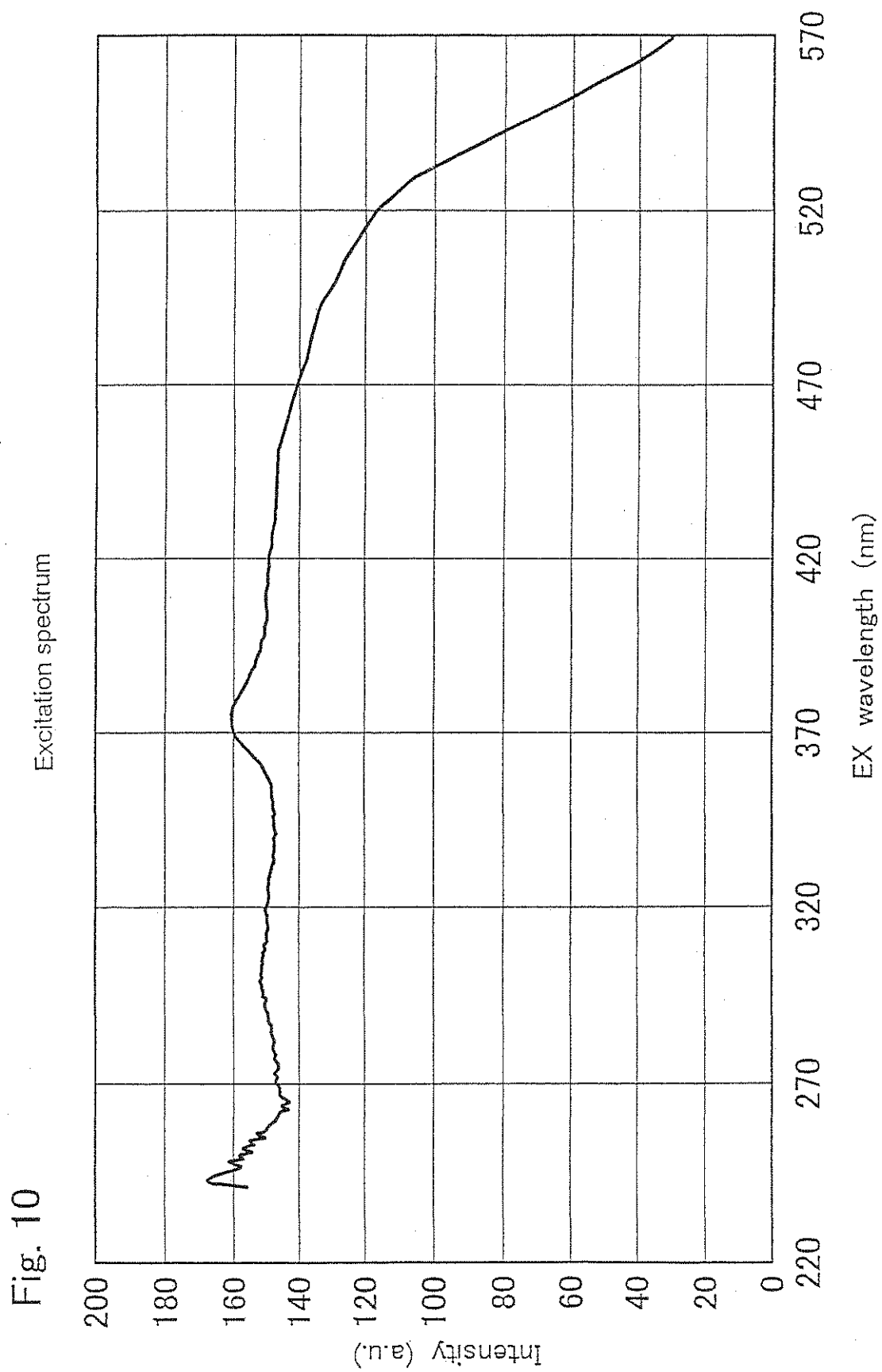
G : Green GY : Yellow green
Y : Yellow YR : Yellow red
R : Red RP : Red purple
B : Blue BG : Blue green
W : White PB : Blue purple
P : Purple Pk : Pink

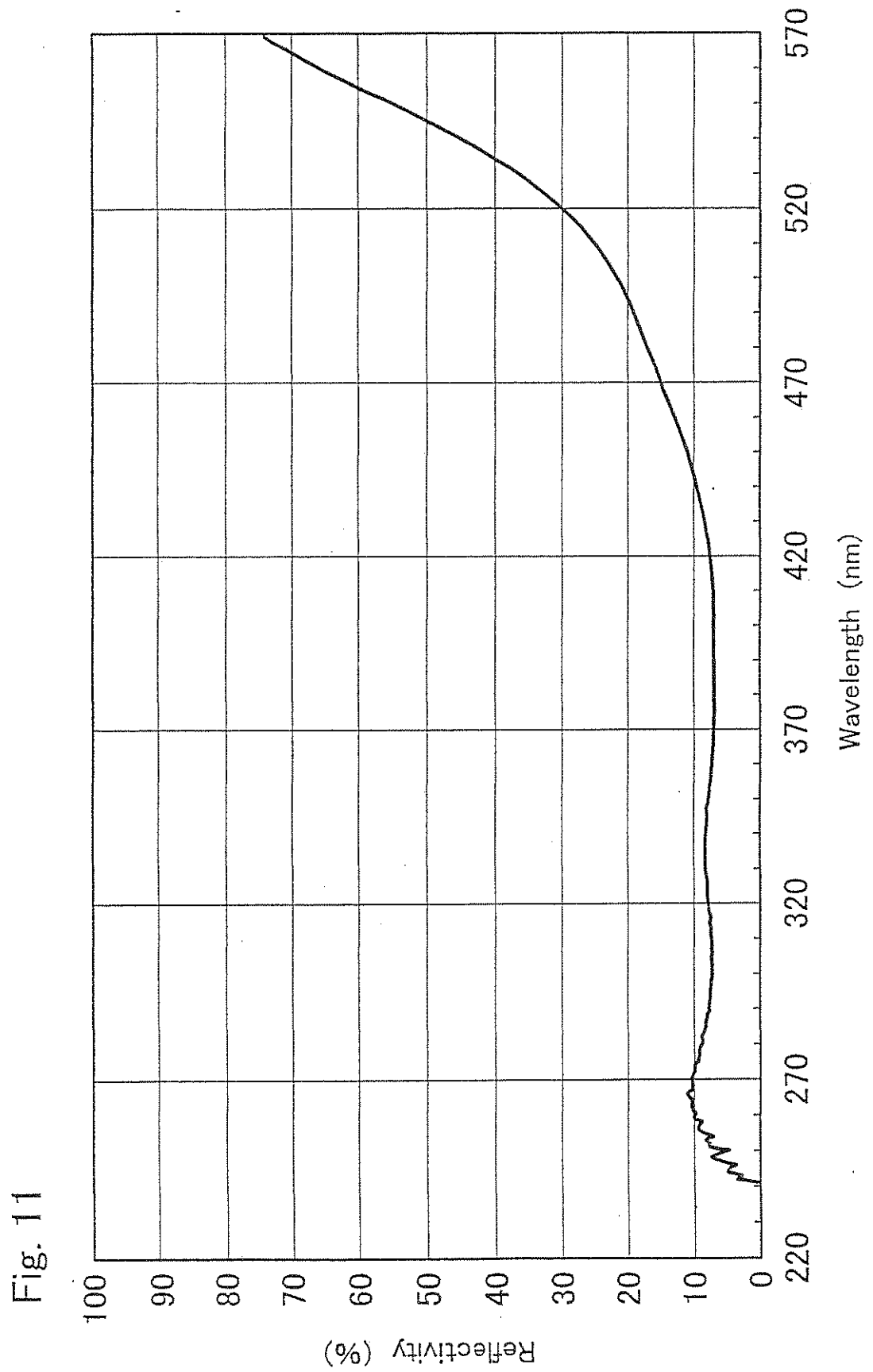
pl.Y : pale yellow
pl.G : pale green
pl.B : pale blue
pl.P : pale purple
pl.Pk : pale pink
pl.PB : pale blue purple
pl.GY : pale yellow green
pl.BG : pale blue green
pl.YR : pale yellow red

b.W : Bluish white
g.W : Greenish white
p.W : Purplish white
y.W : Yellowish white
o.Pk : Orange pink
p.Pk : Purplish pink

Fig. 9







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Fig. 12A

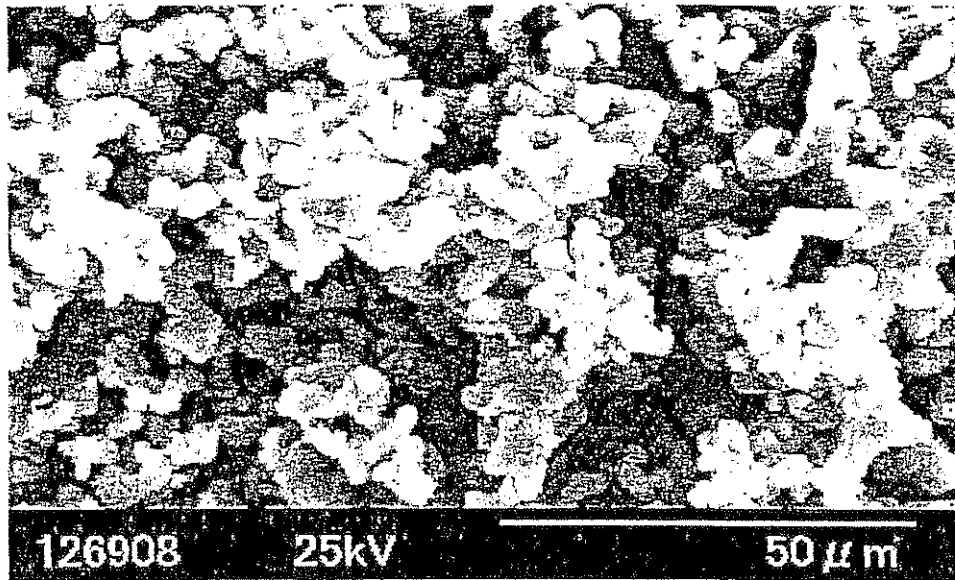


Fig. 12B

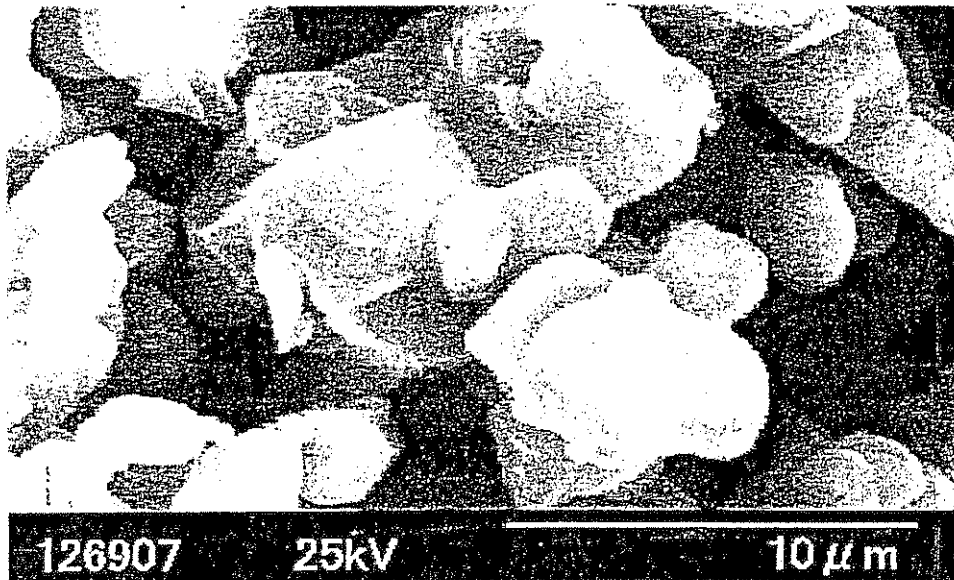
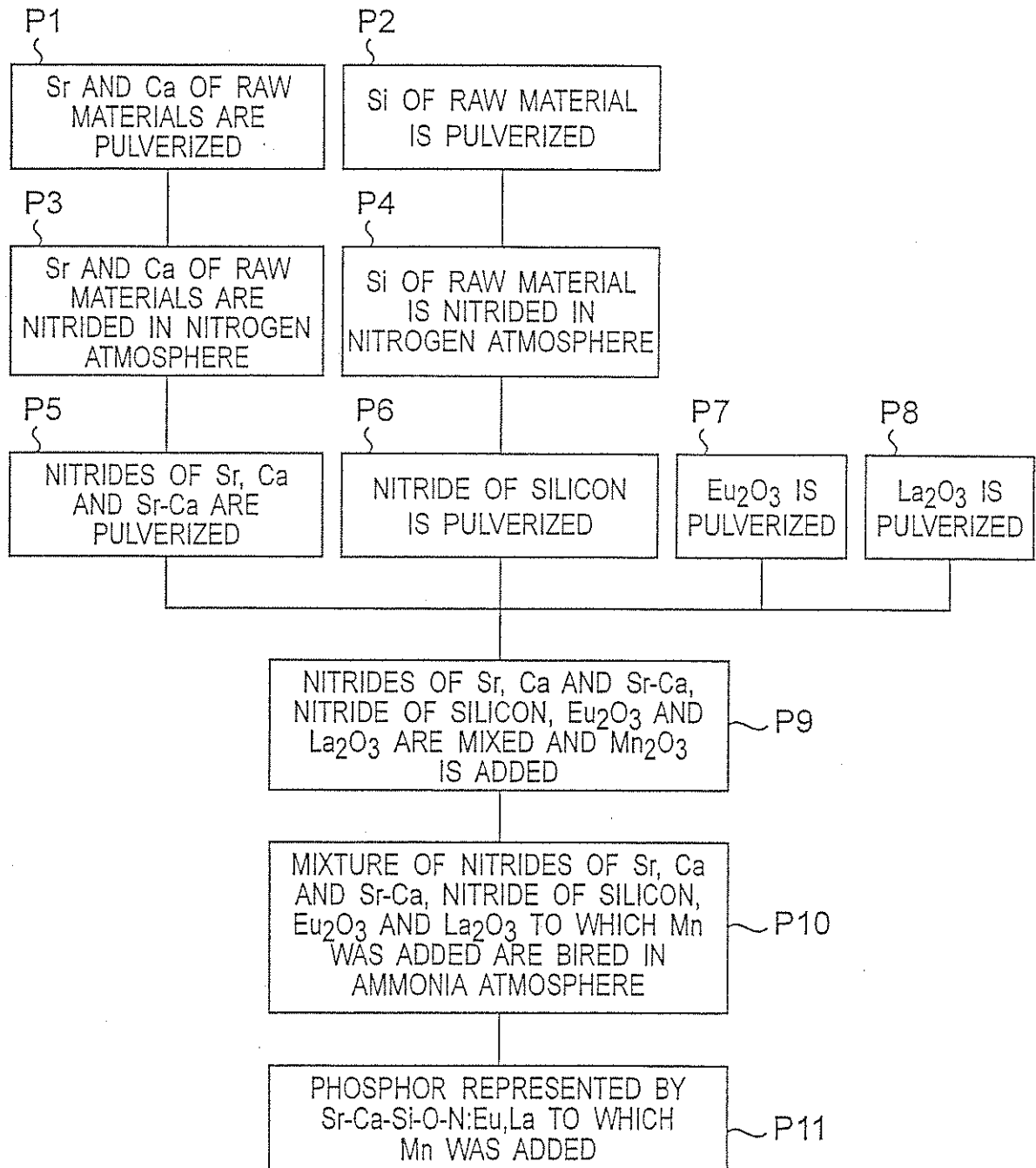
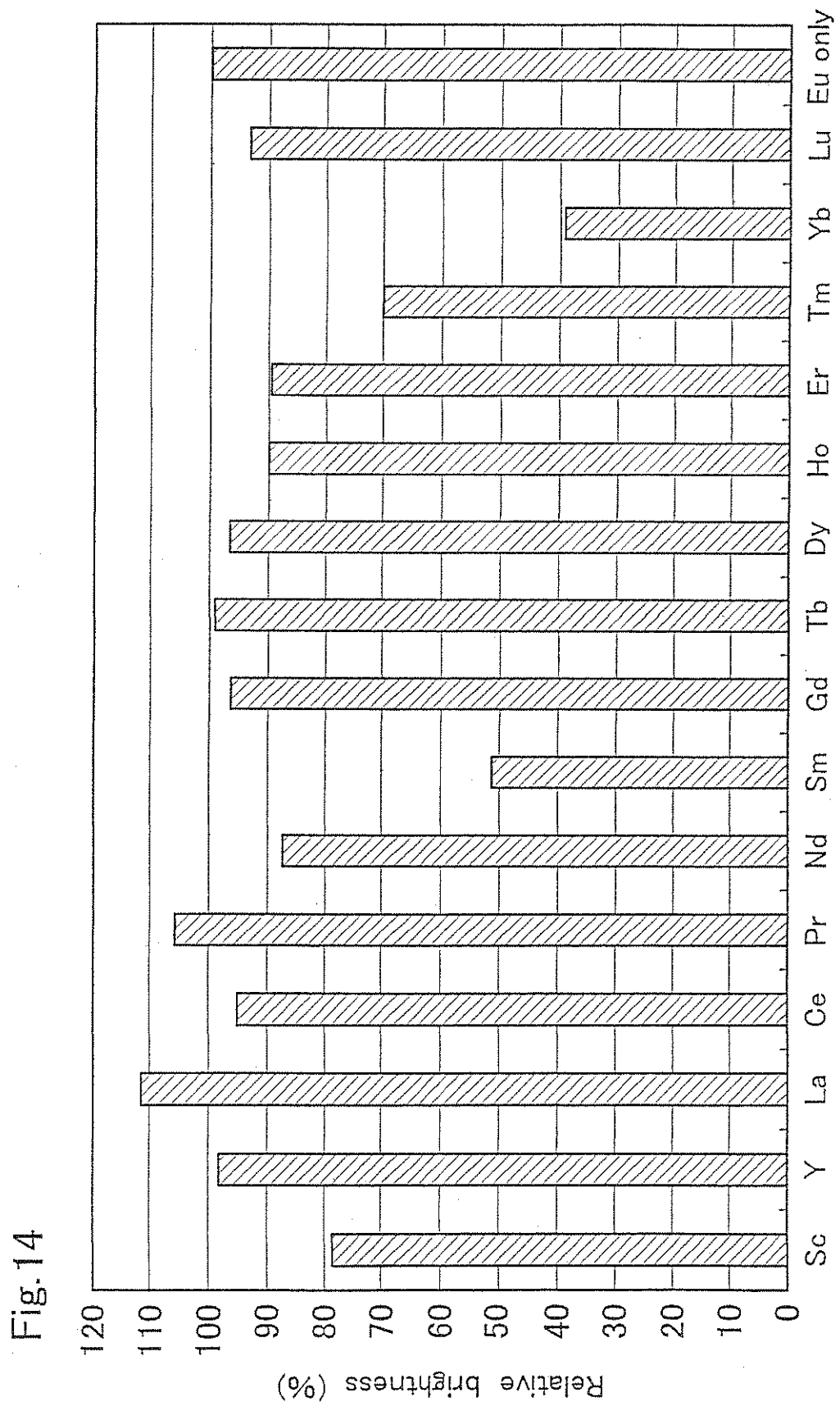


Fig. 13





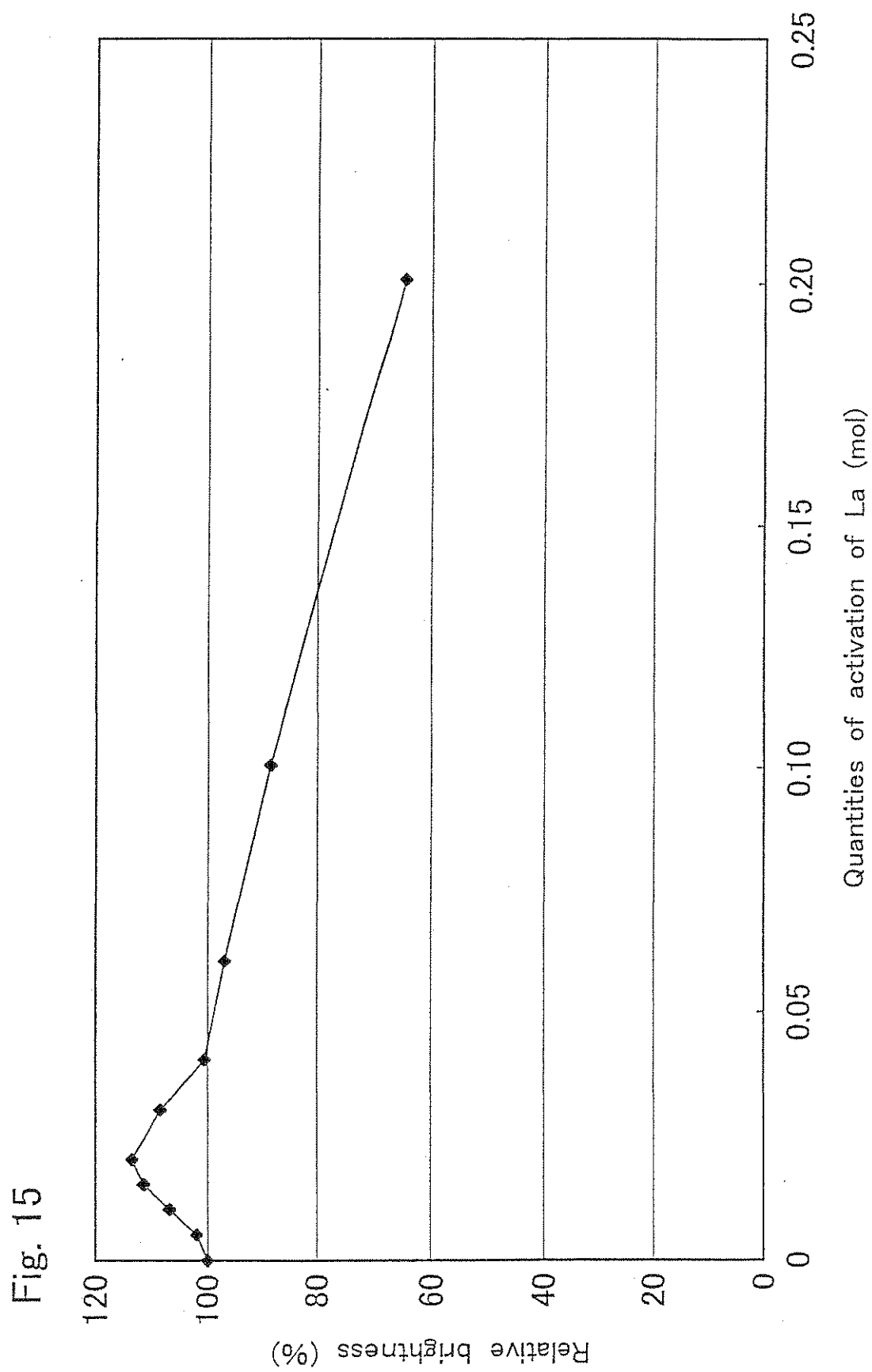


Fig. 16

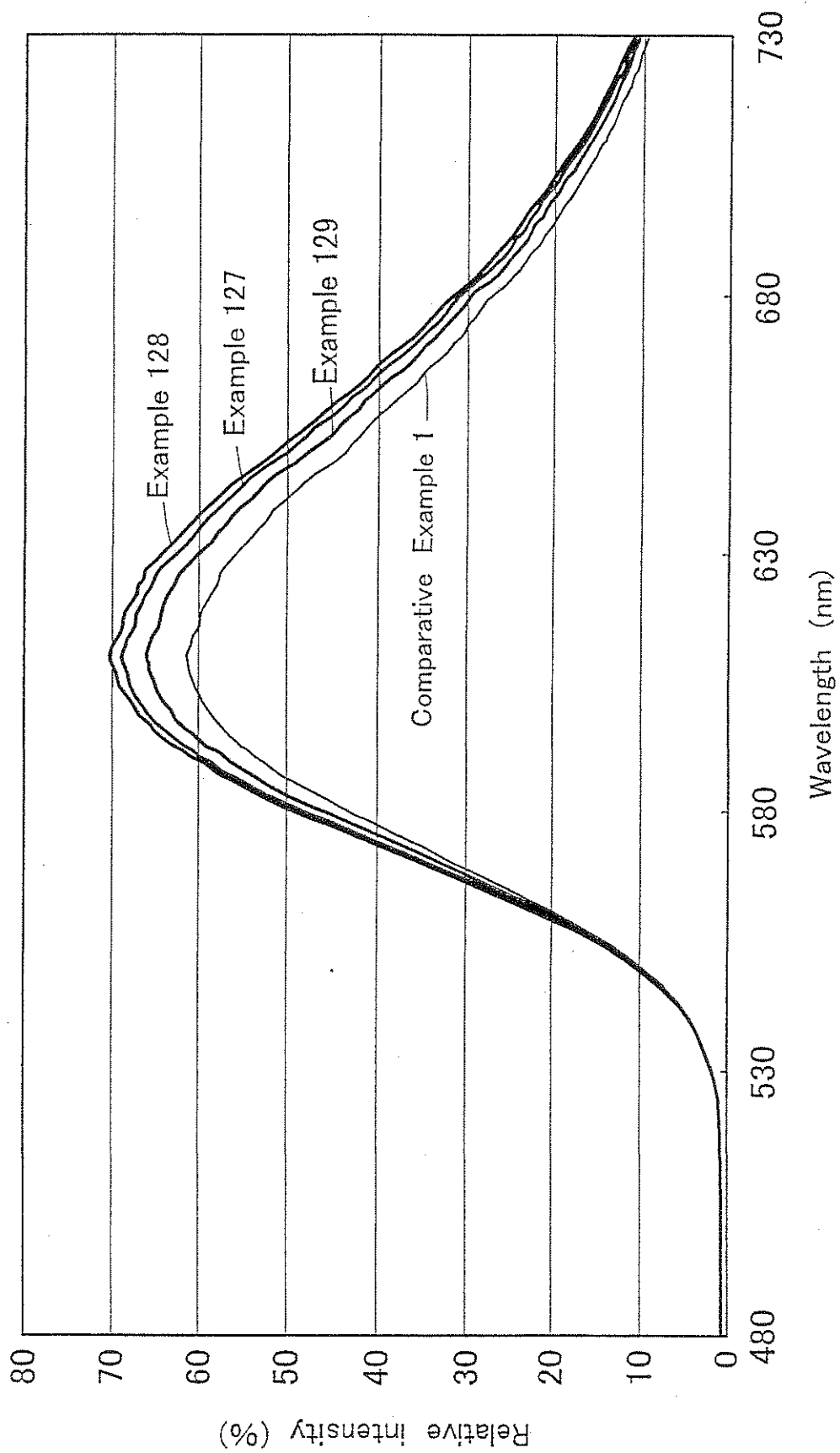


Fig. 17

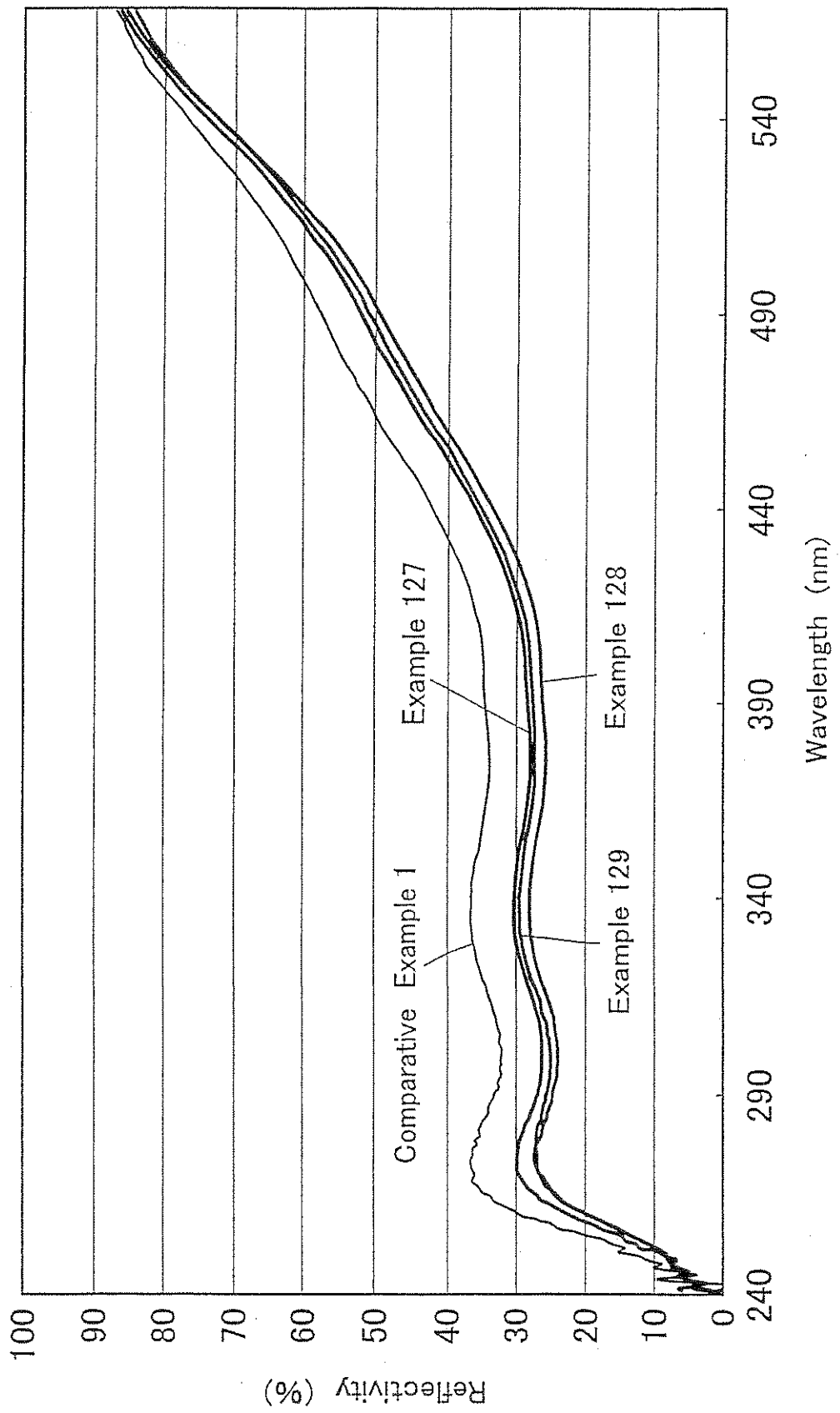


Fig. 18

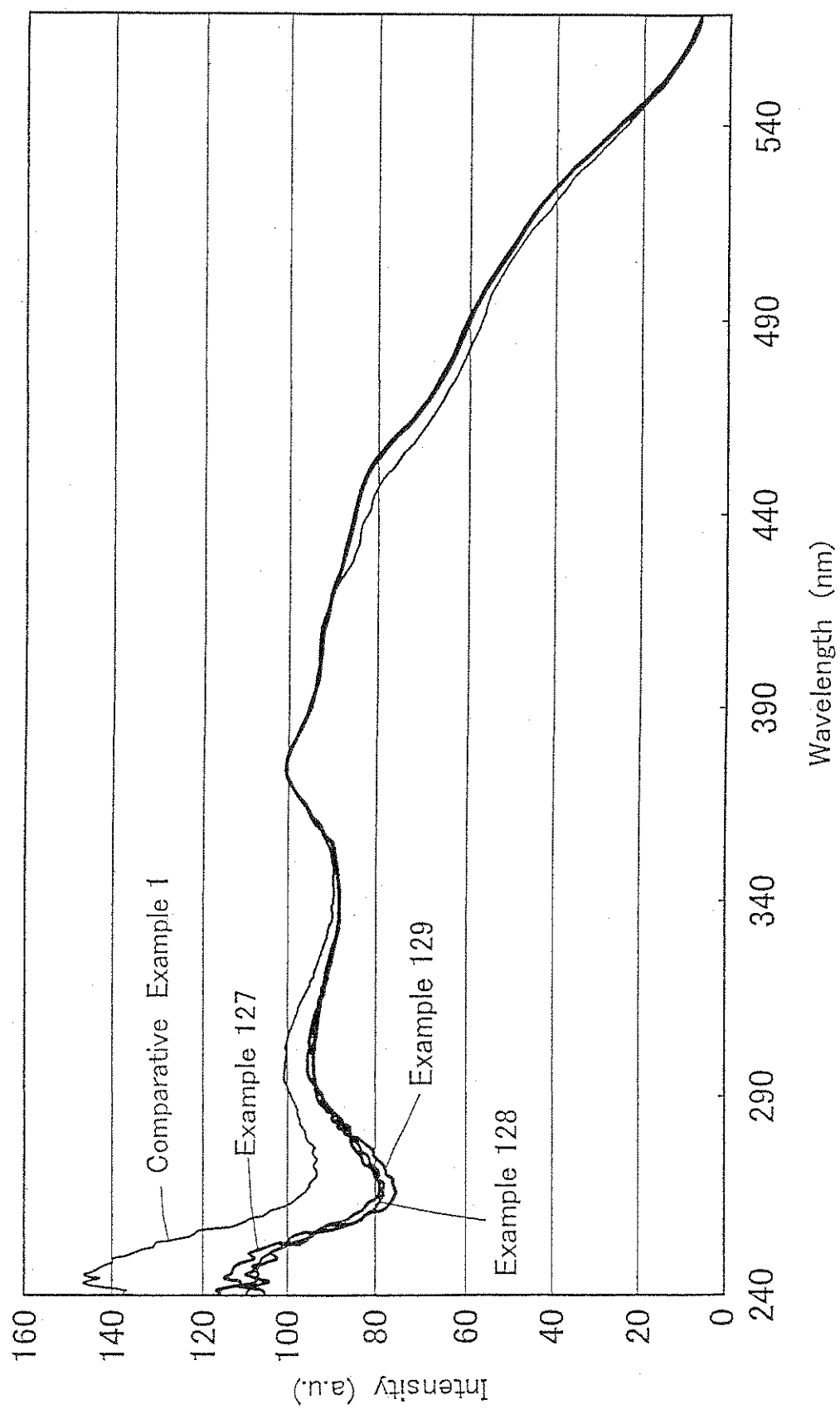


Fig. 19A

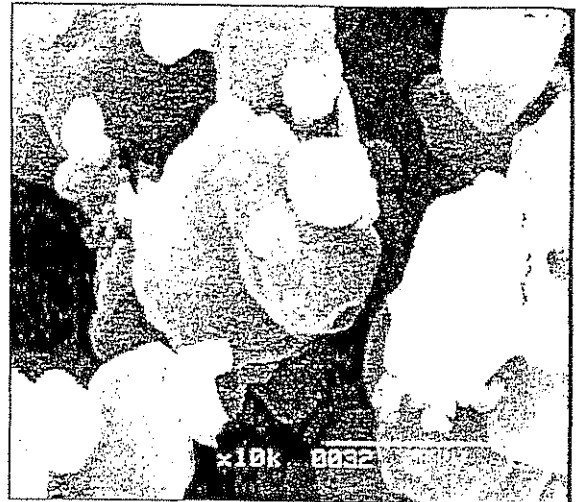
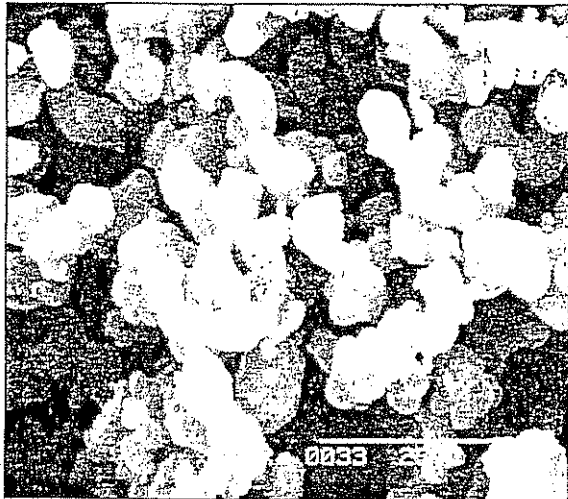


Fig. 19B

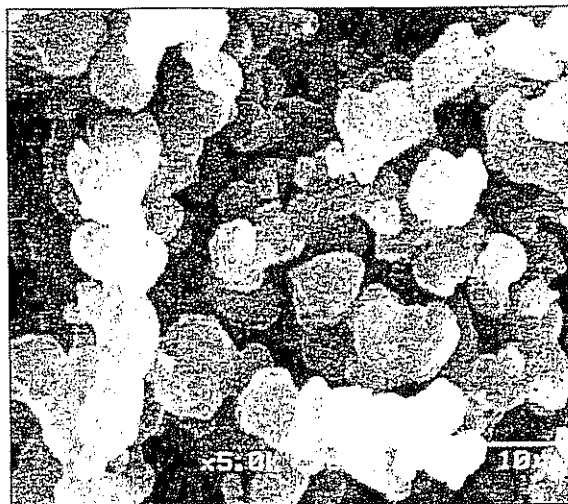
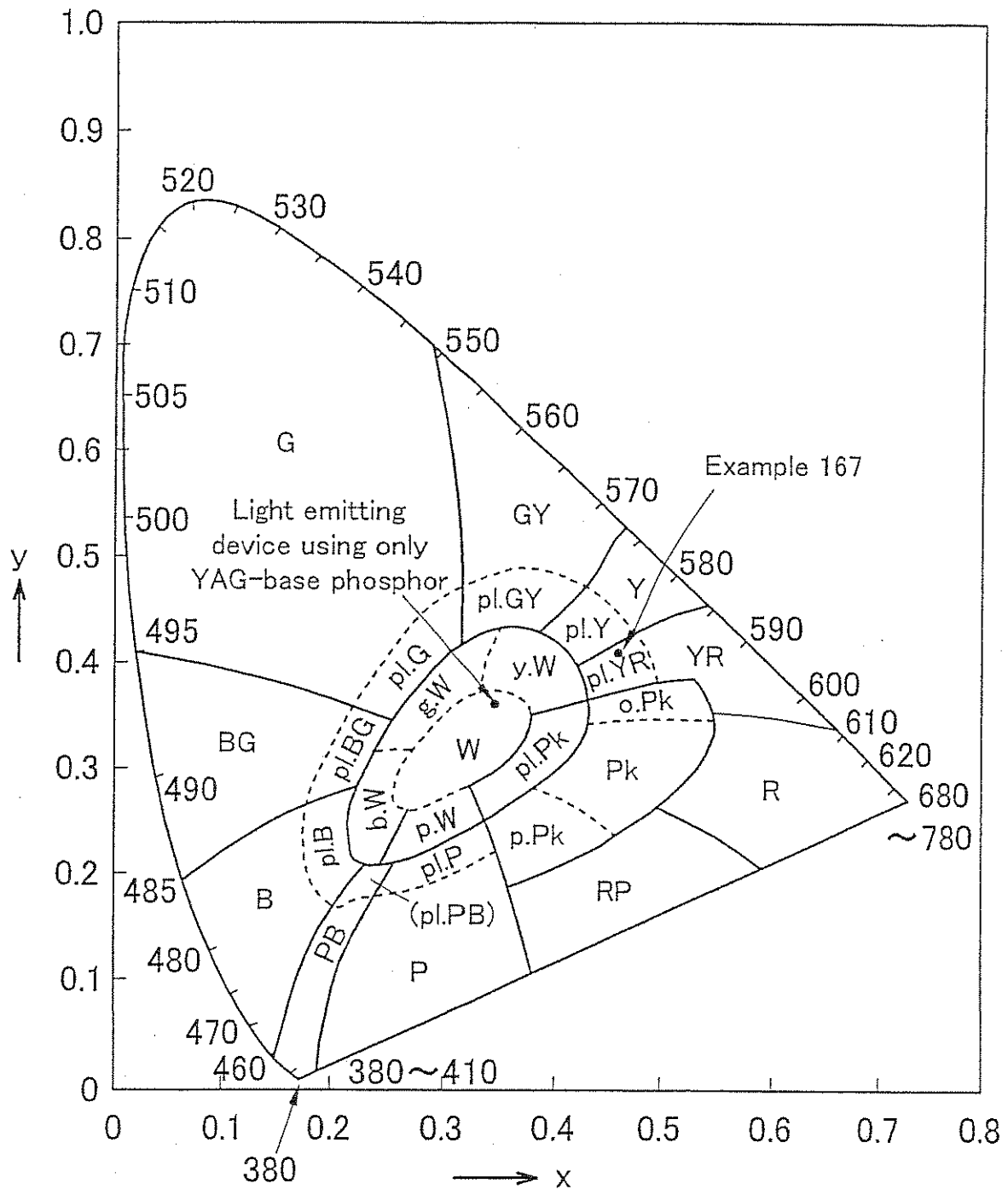


Fig. 20

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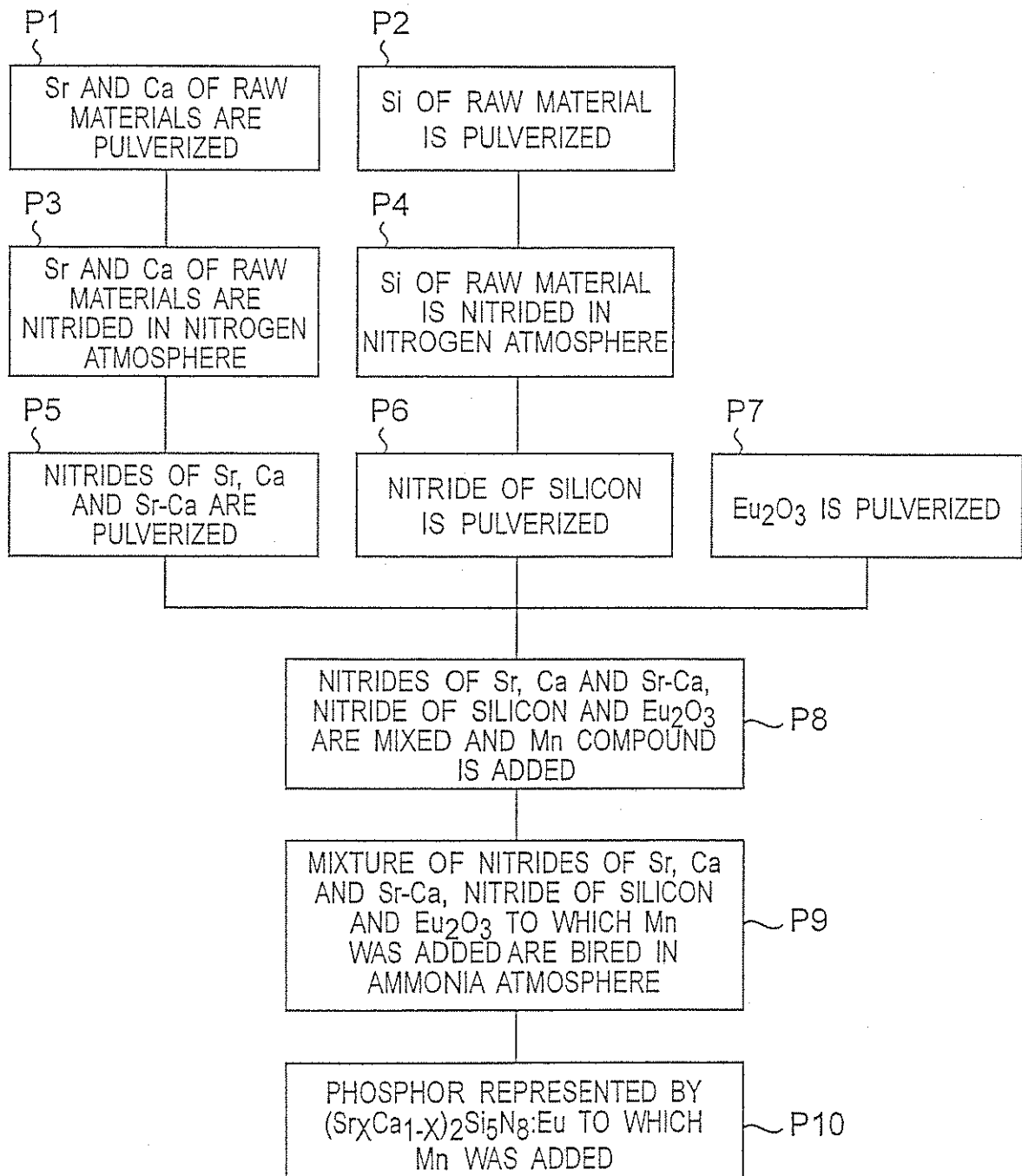


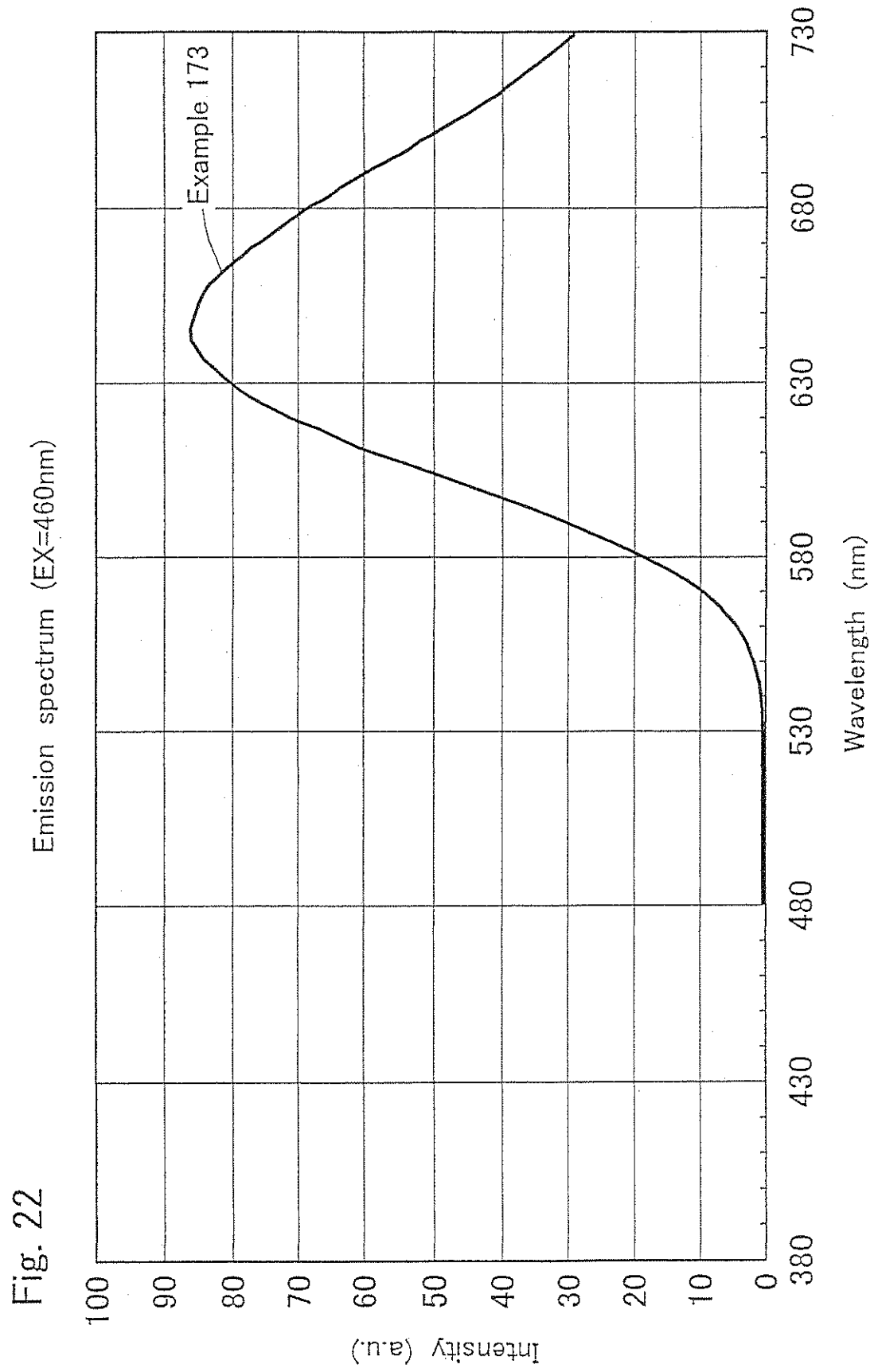
G : Green
Y : Yellow
R : Red
B : Blue
W : White
P : Purple
GY : Yellow green
YR : Yellow red
RP : Red purple
BG : Blue green
PB : Blue purple
Pk : Pink

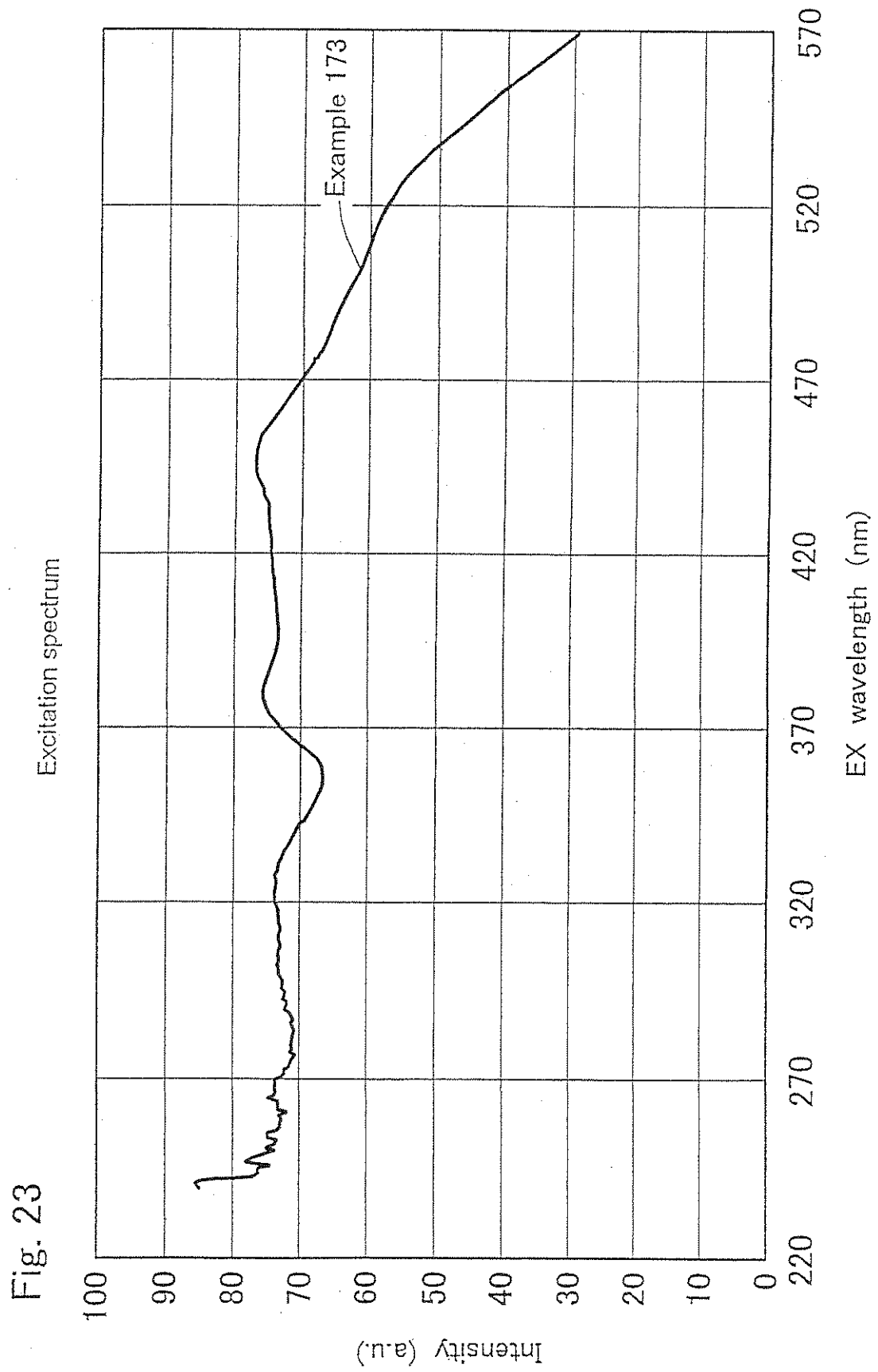
pl.Y : pale yellow
pl.G : pale green
pl.B : pale blue
pl.P : pale purple
pl.Pk : pale pink
pl.PB : pale blue purple
pl.GY : pale yellow green
pl.BG : pale blue green
pl.YR : pale yellow red

b.W : Bluish white
g.W : Greenish white
p.W : Purplish white
y.W : Yellowish white
o.Pk : Orange pink
p.Pk : Purplish pink

Fig.21







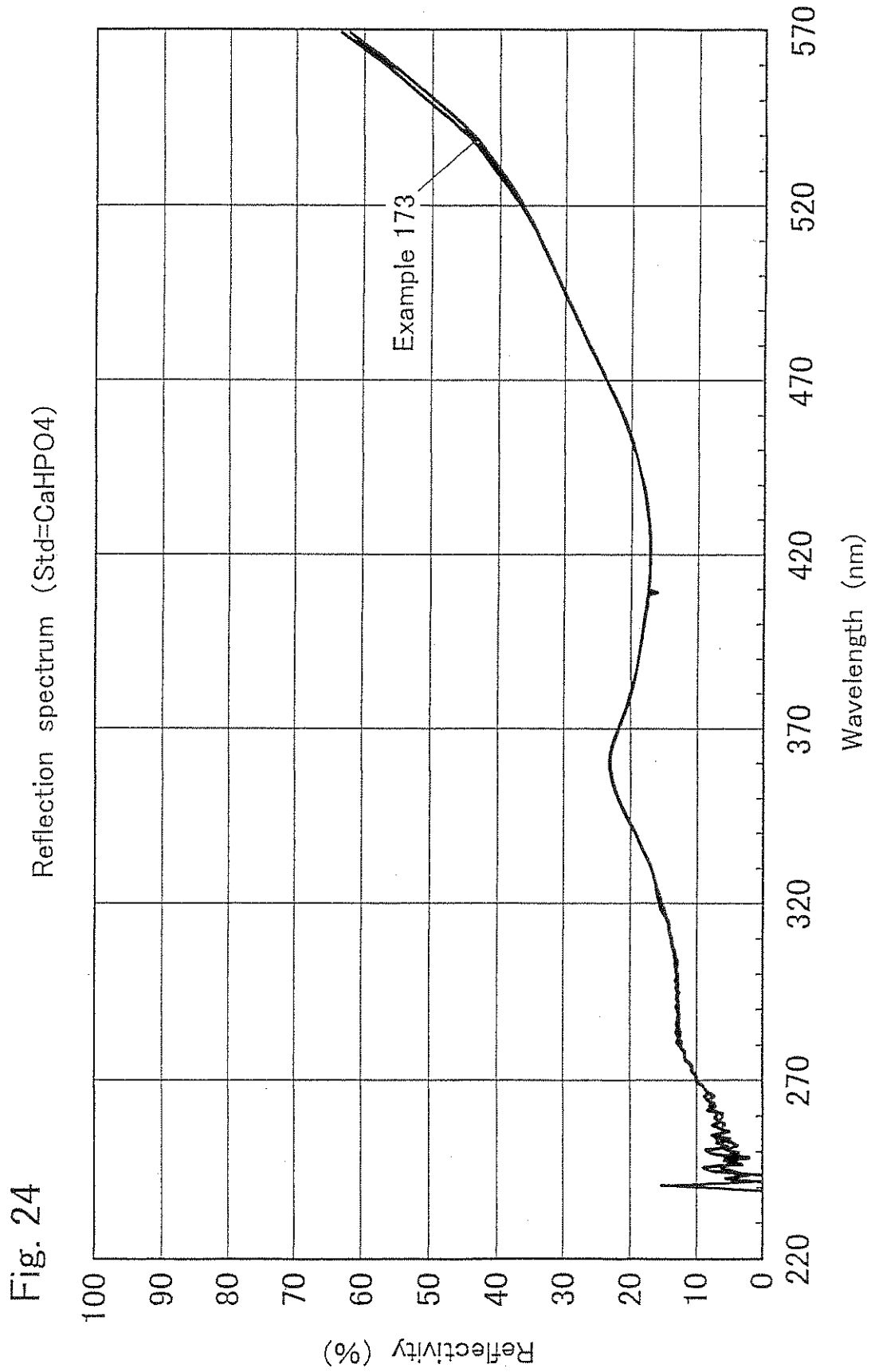


Fig. 25

Emission spectrum (EX=460nm)

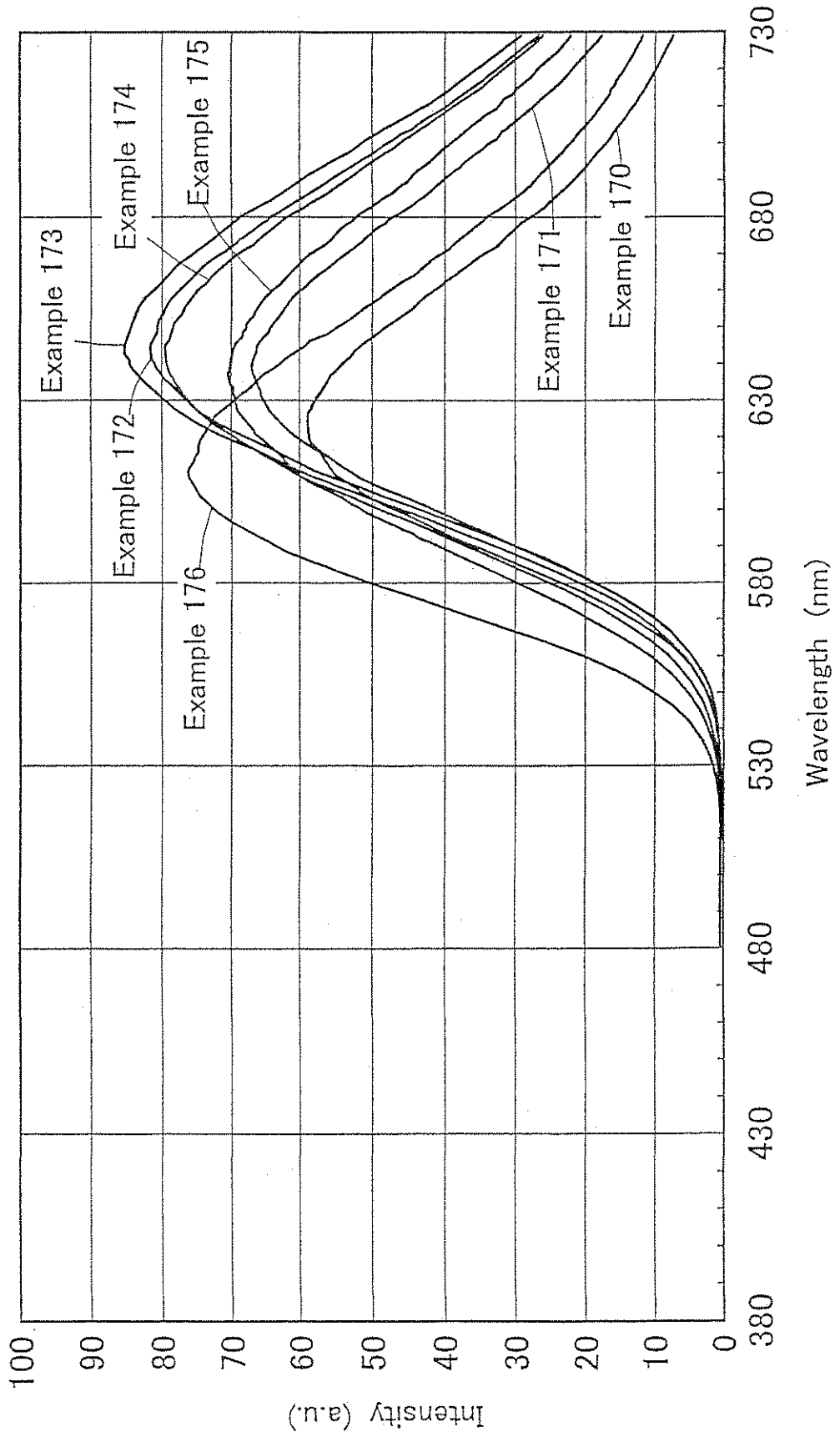


Fig. 26

Emission spectrum (EX=460nm)

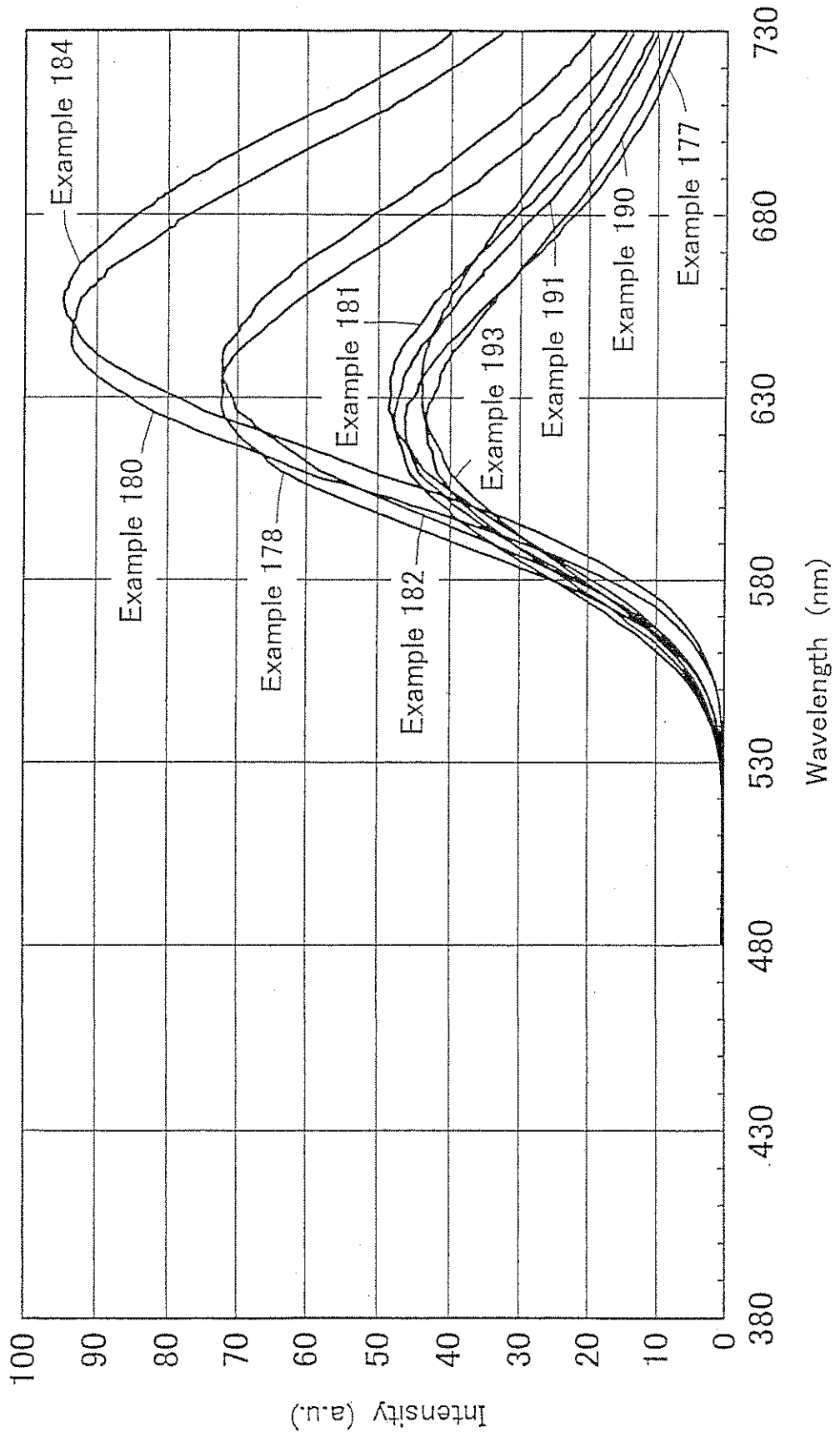


Fig. 27A

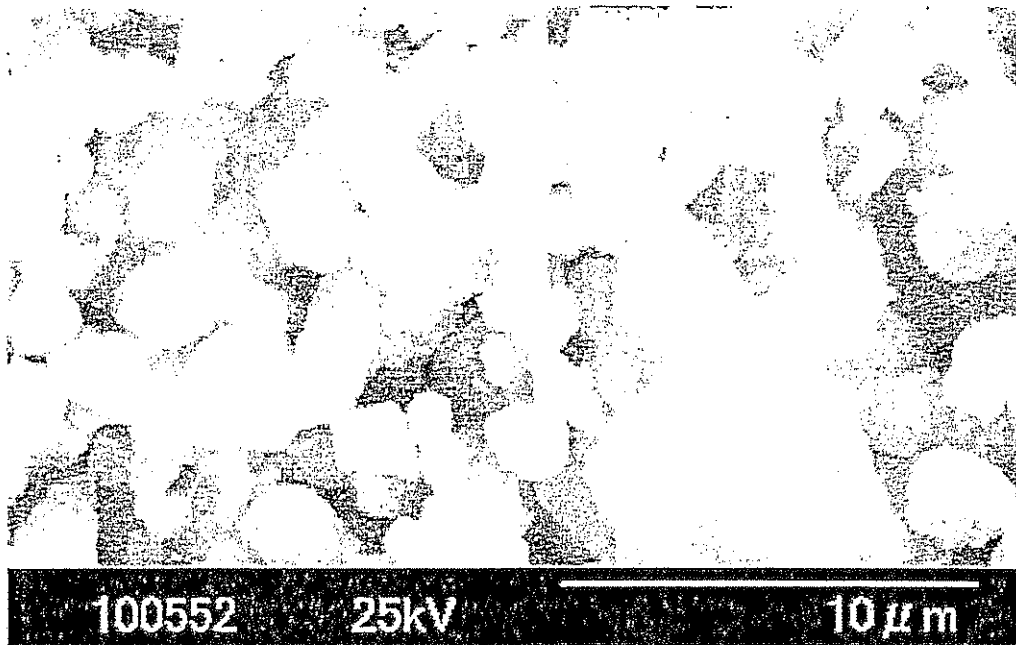


Fig. 27B

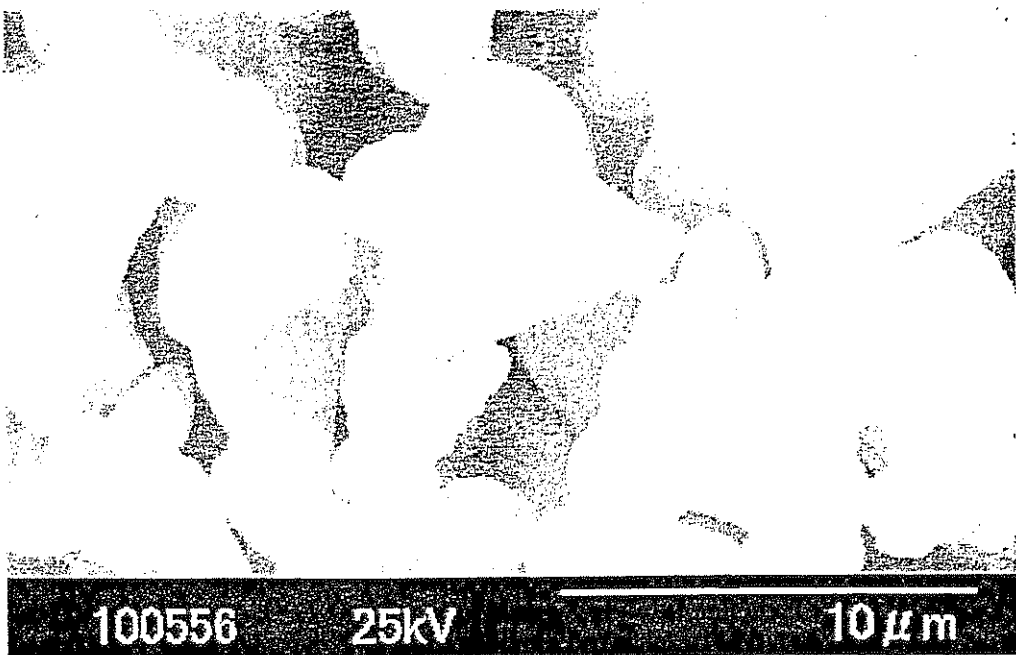


Fig. 28

Whole beam is equalized and compared

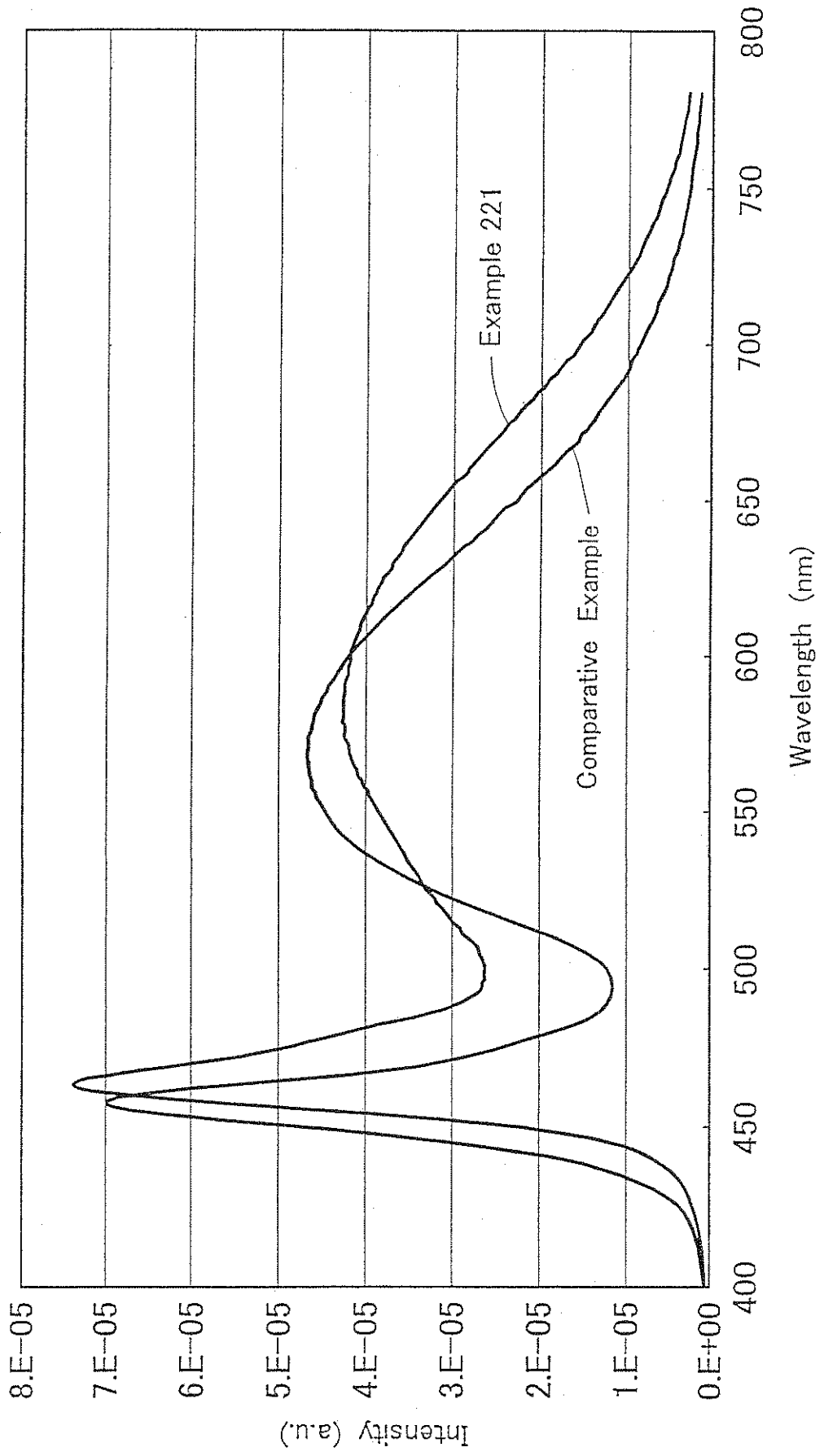


Fig. 29

Evaluation of color rendering property

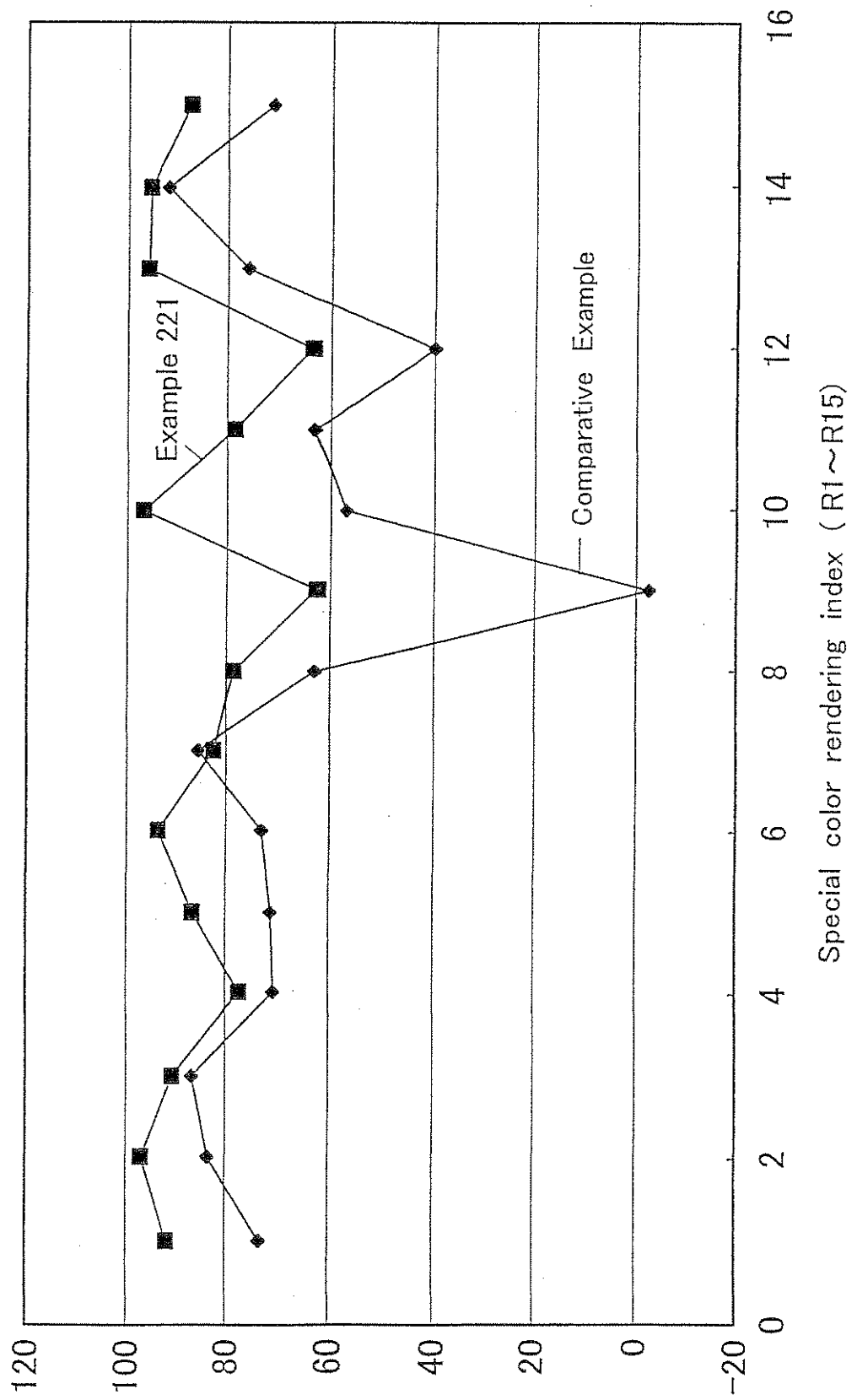


Fig. 30

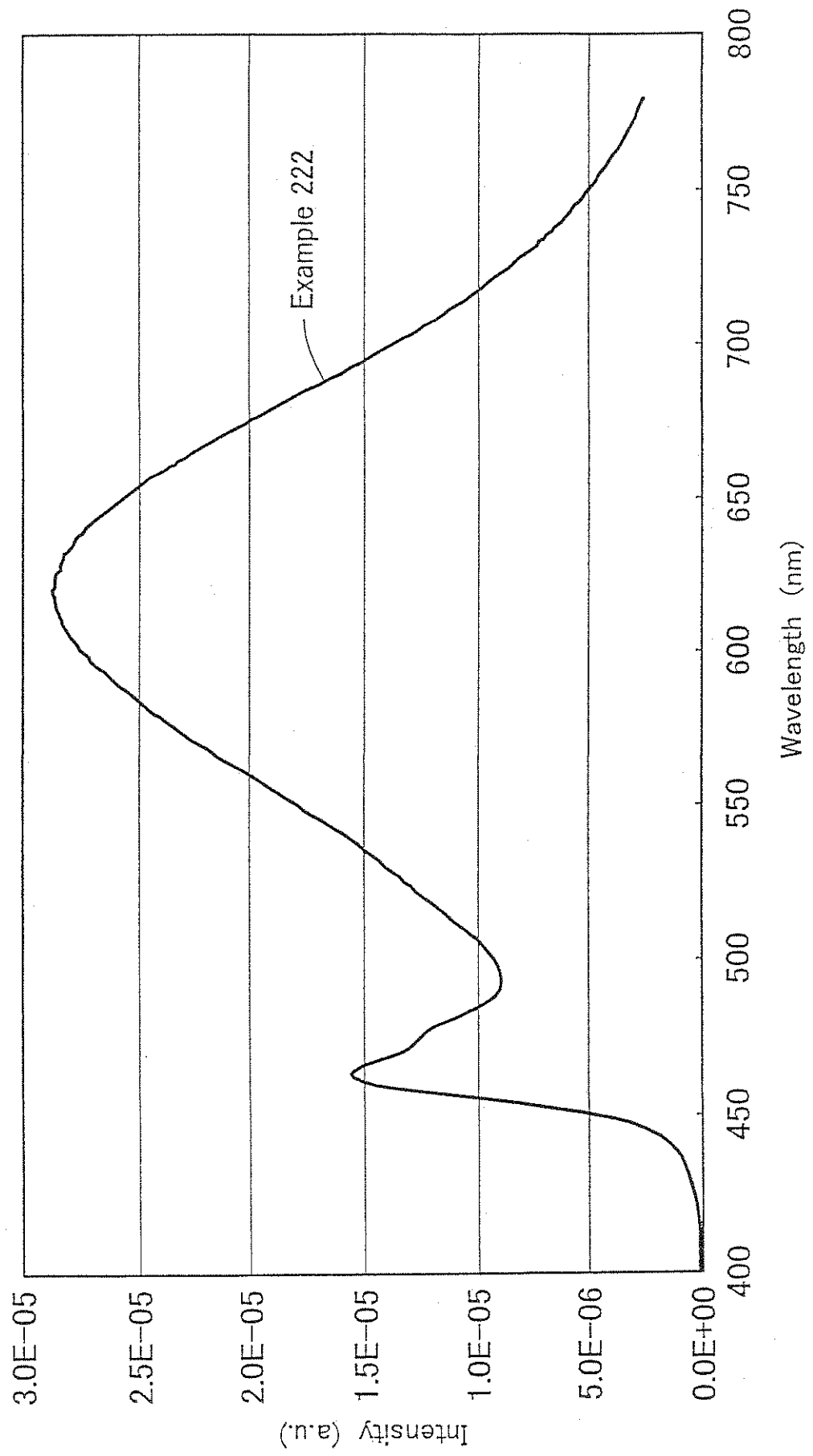


Fig. 31

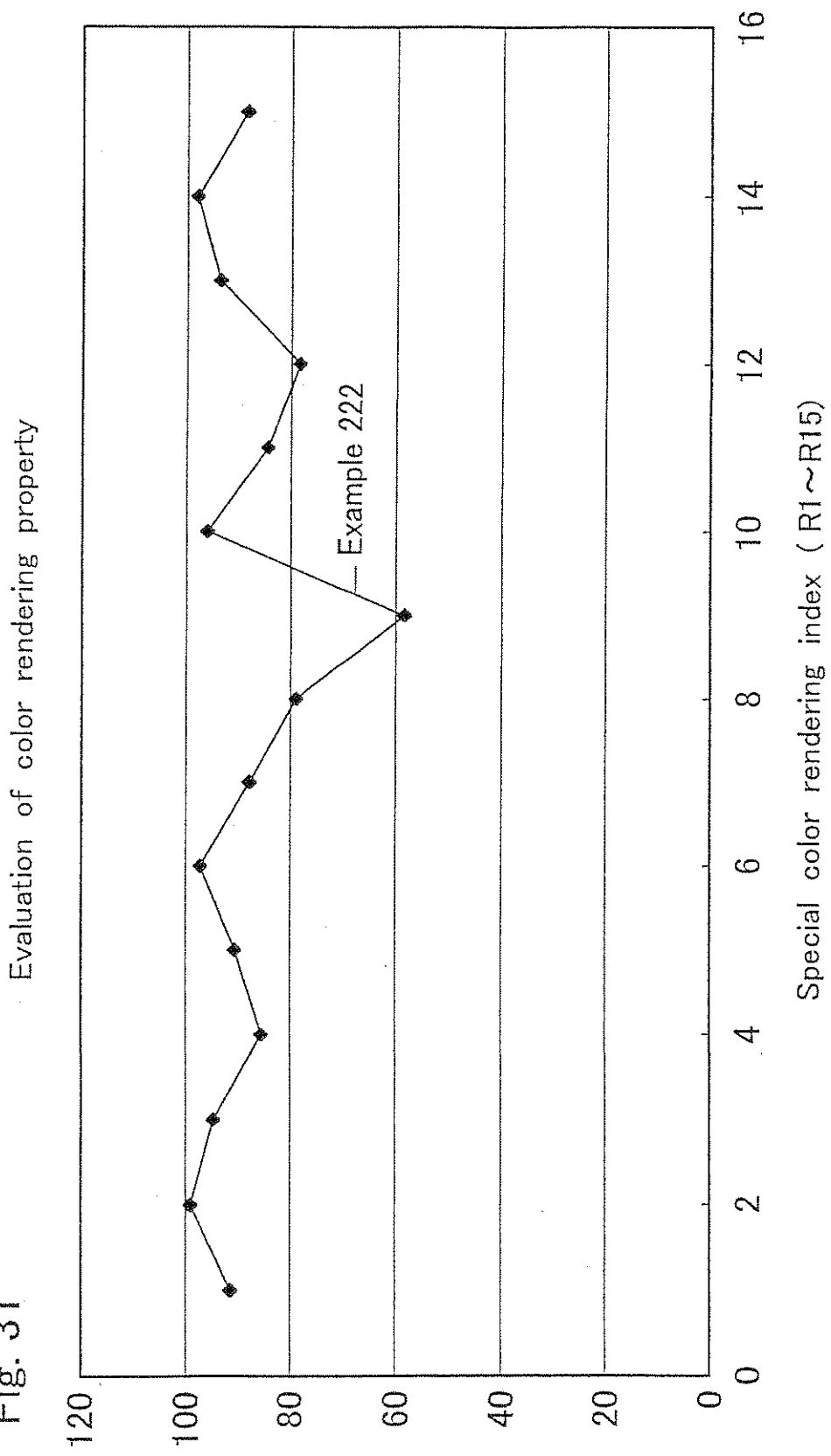
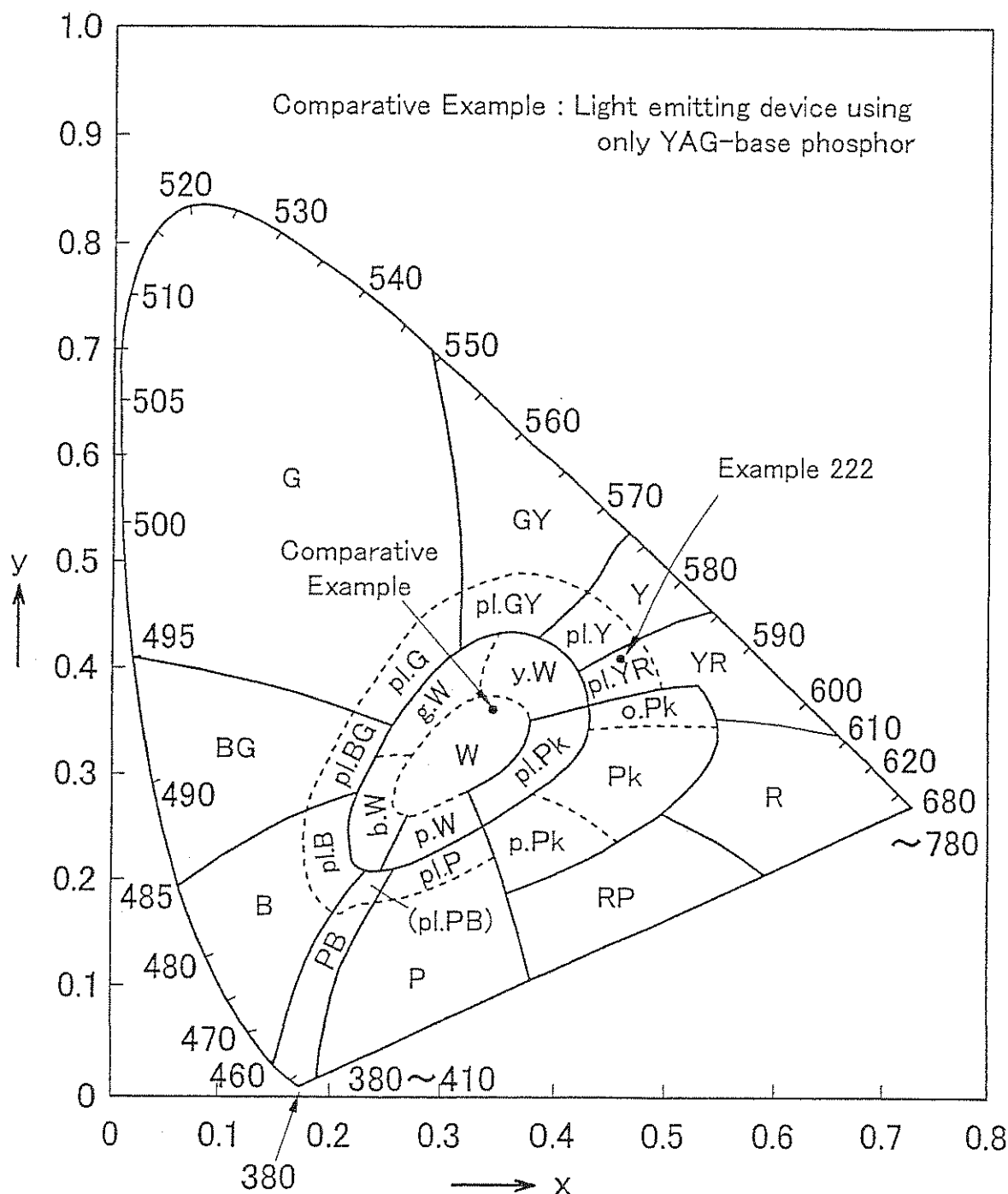


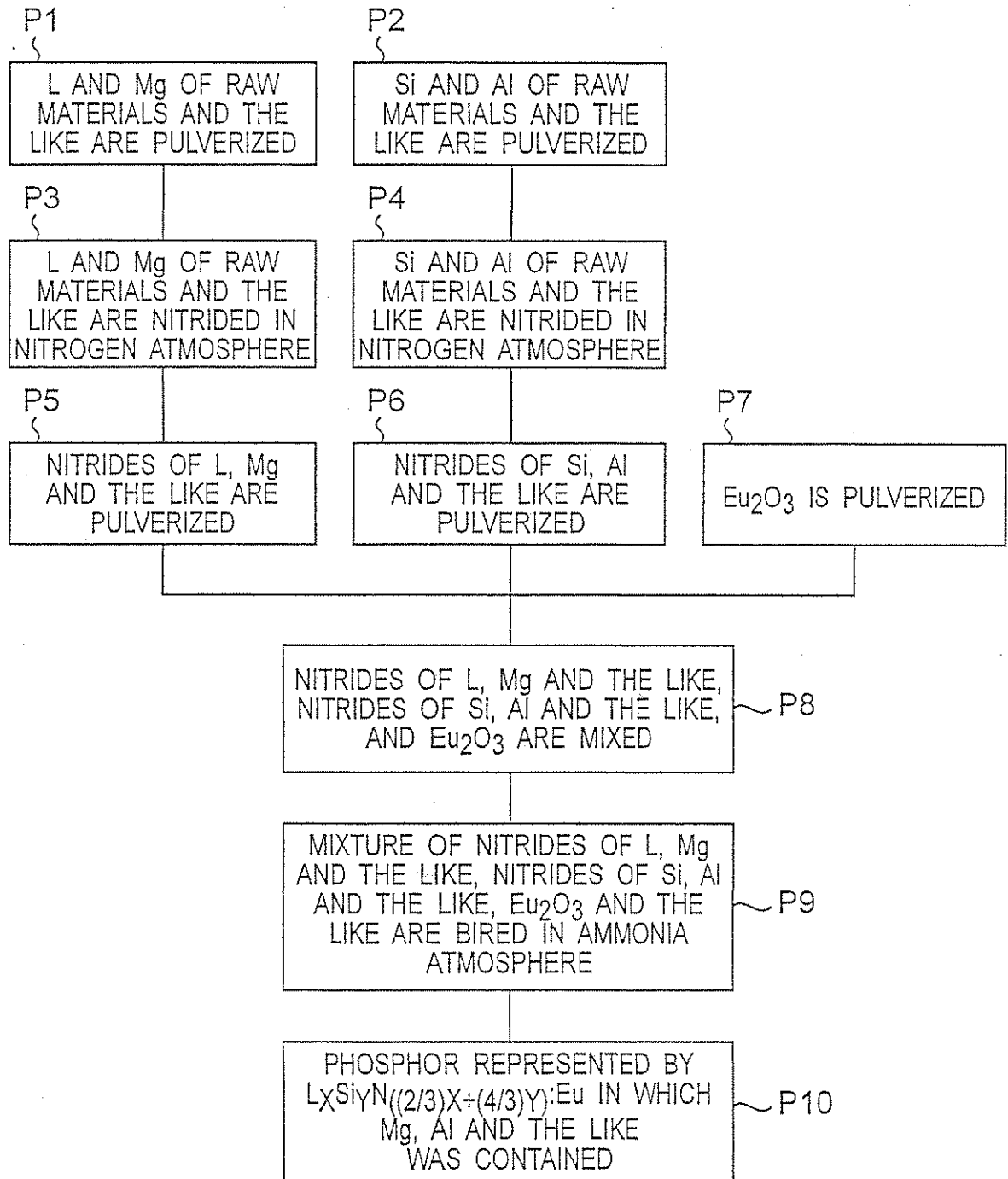
Fig. 32

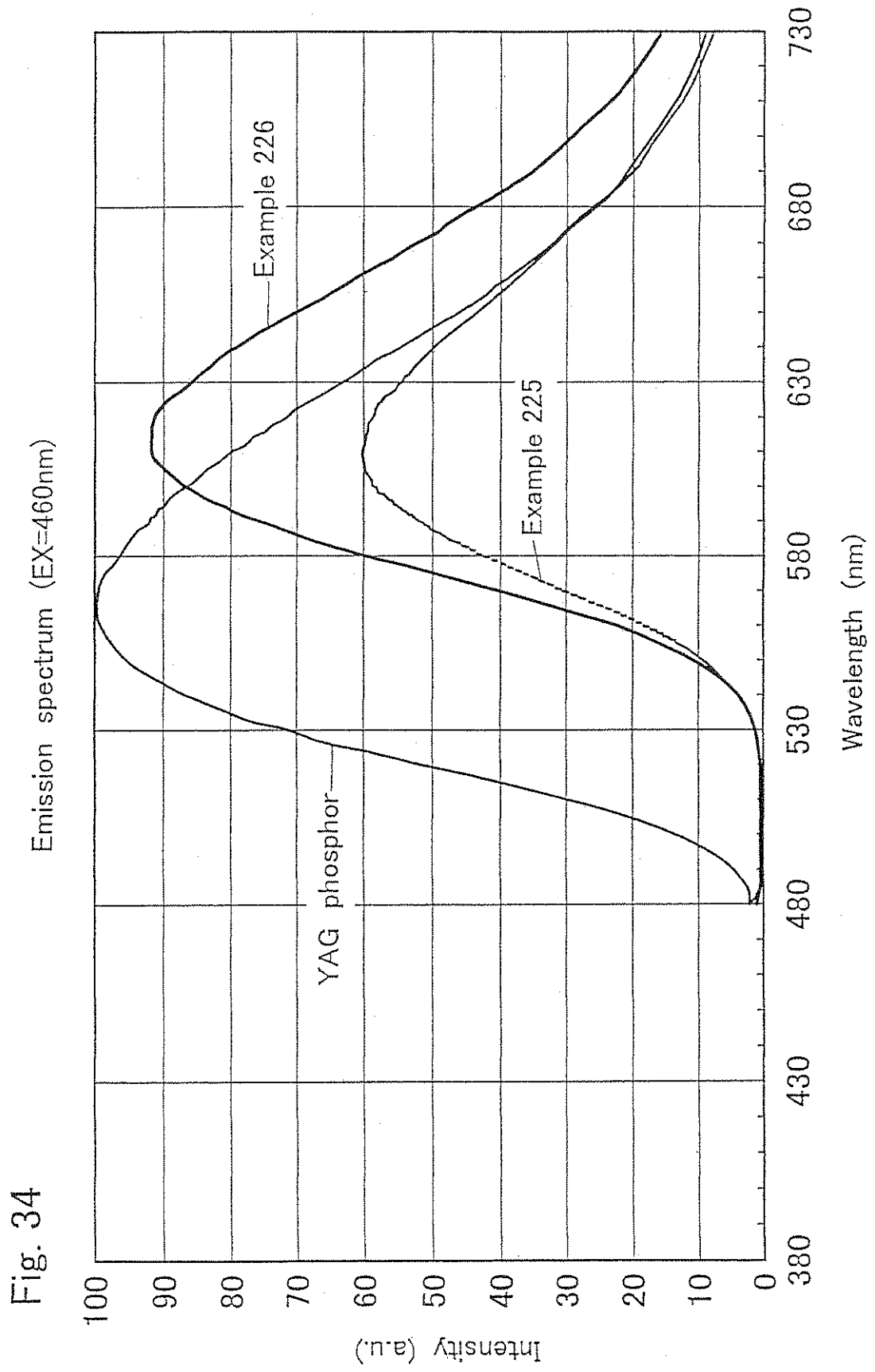
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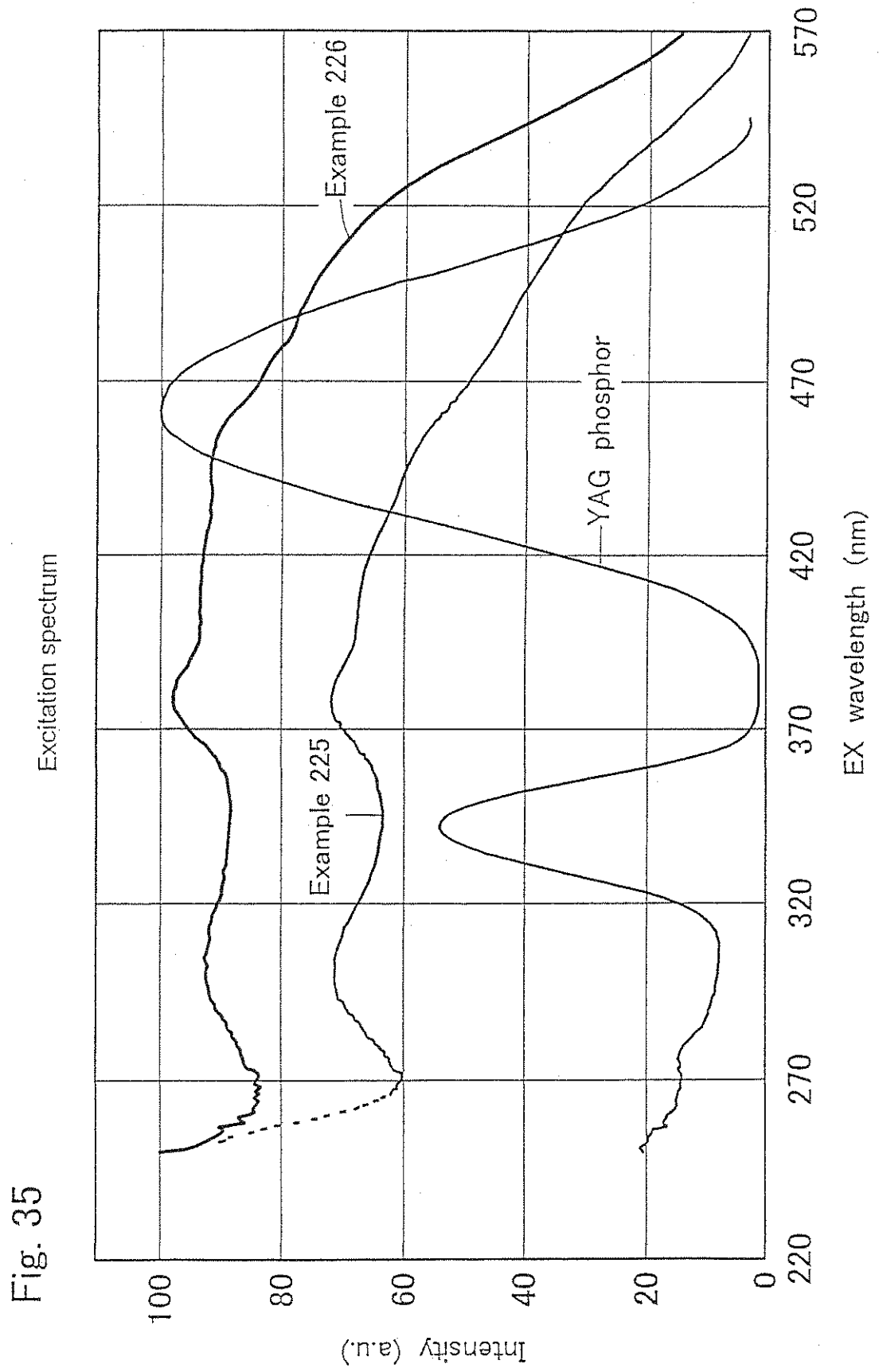


- | | | | |
|------------|-------------------|---------------------------|-----------------------|
| G : Green | GY : Yellow green | pl.Y : pale yellow | b.W : Bluish white |
| Y : Yellow | YR : Yellow red | pl.G : pale green | g.W : Greenish white |
| R : Red | RP : Red purple | pl.B : pale blue | p.W : Purplish white |
| B : Blue | BG : Blue green | pl.P : pale purple | y.W : Yellowish white |
| W : White | PB : Blue purple | pl.Pk : pale pink | o.Pk : Orange pink |
| P : Purple | Pk : Pink | pl.PB : pale blue purple | p.Pk : Purplish pink |
| | | pl.GY : pale yellow green | |
| | | pl.BG : pale blue green | |
| | | pl.YR : pale yellow red | |

Fig.33







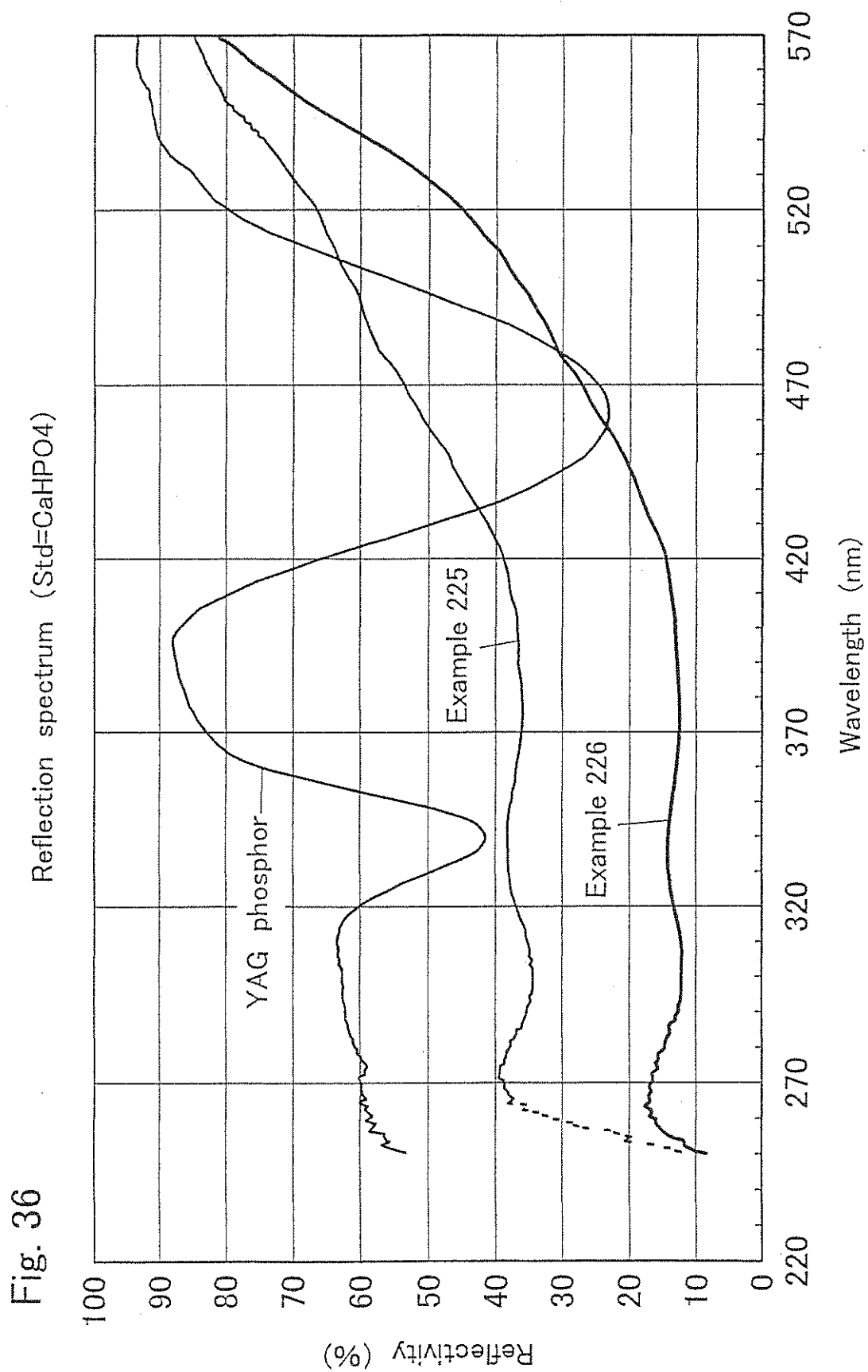
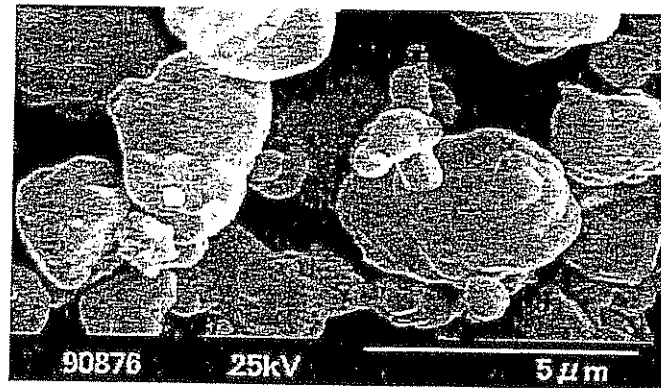
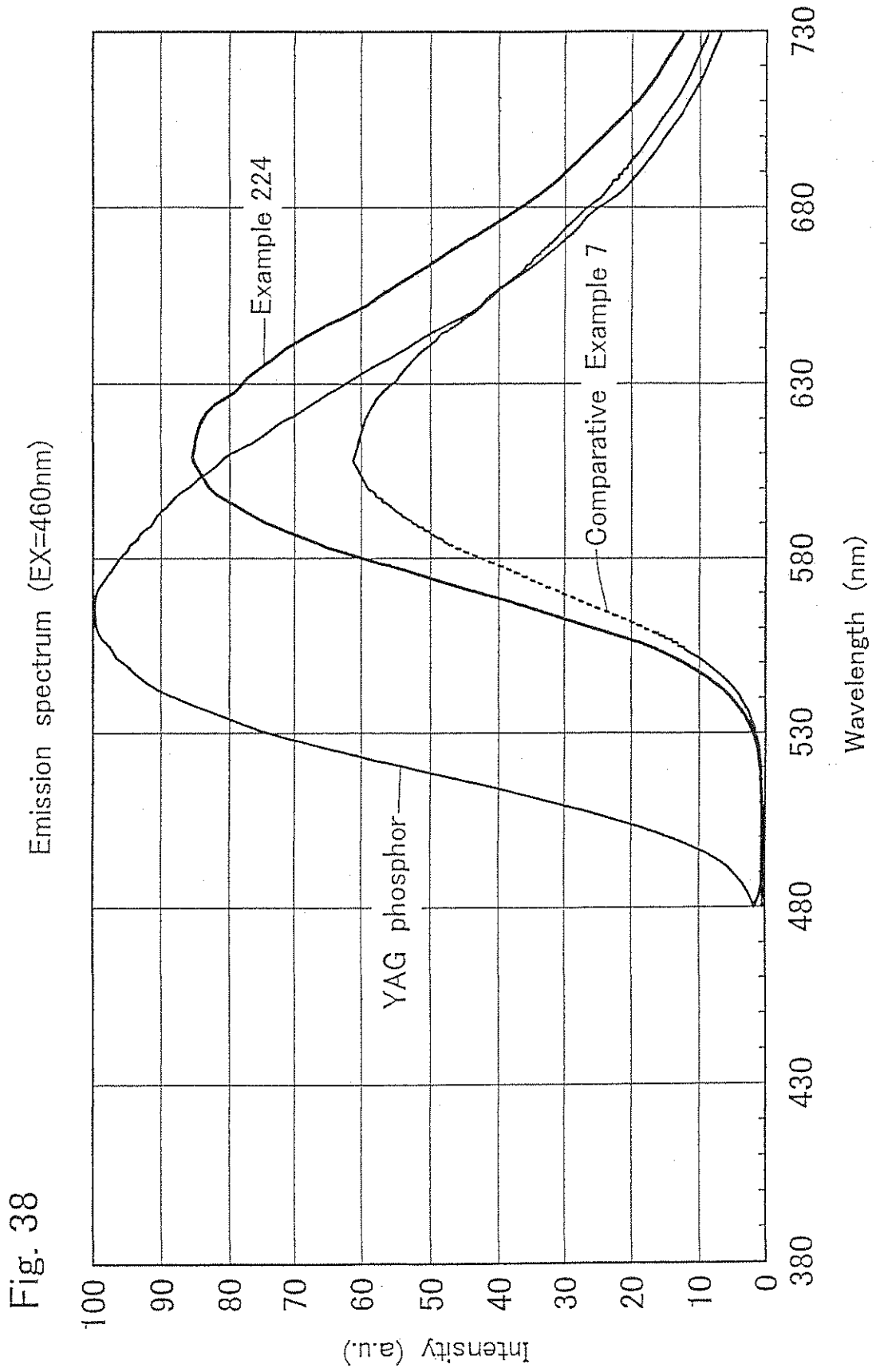


Fig. 37





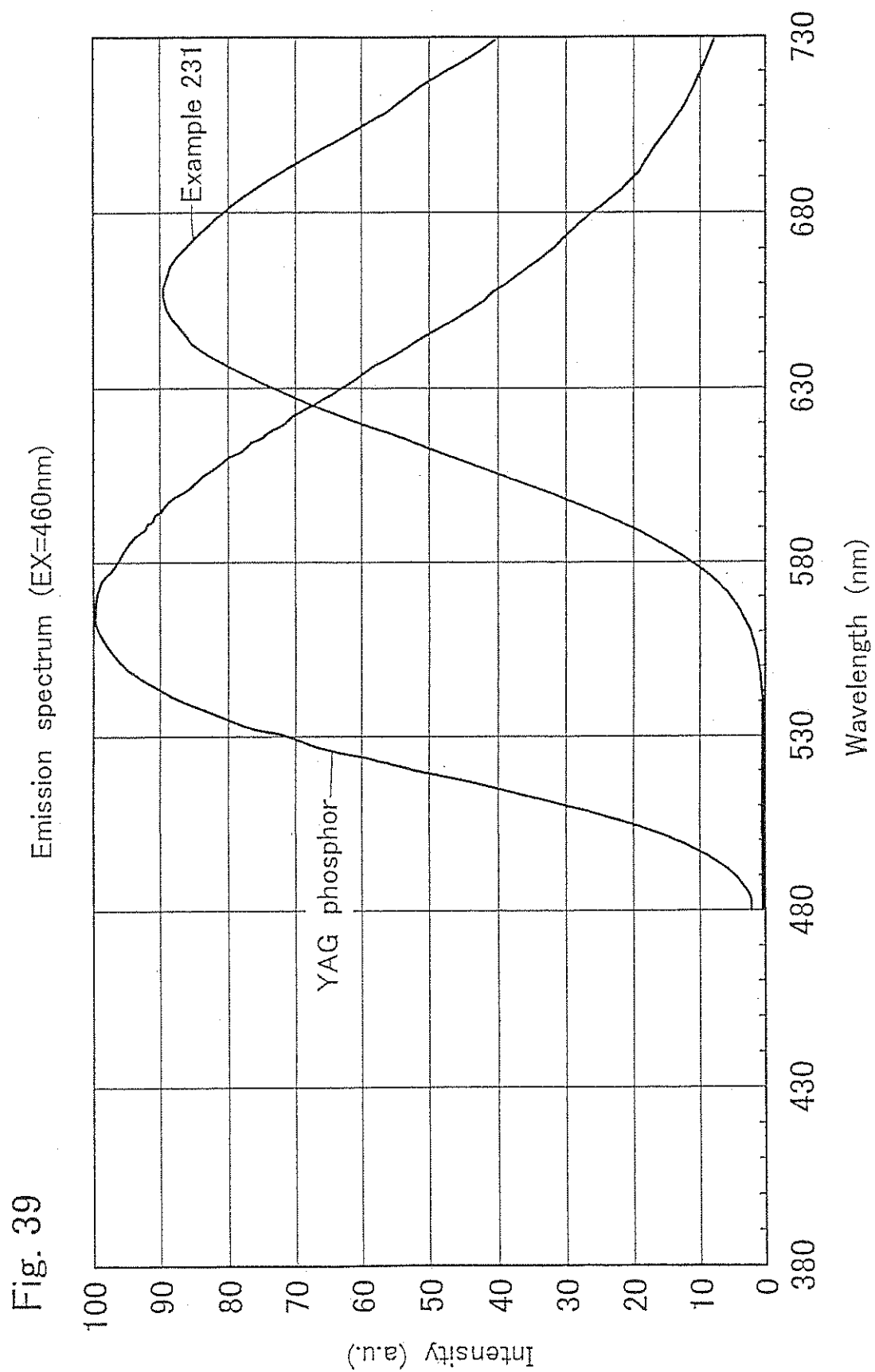


Fig. 40

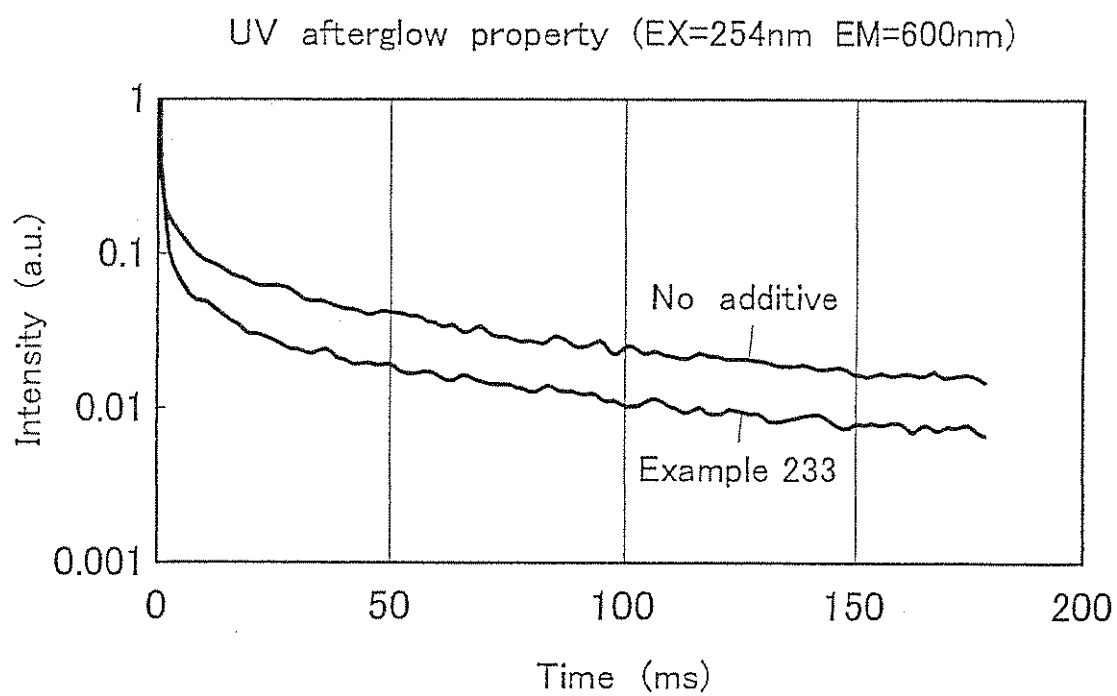
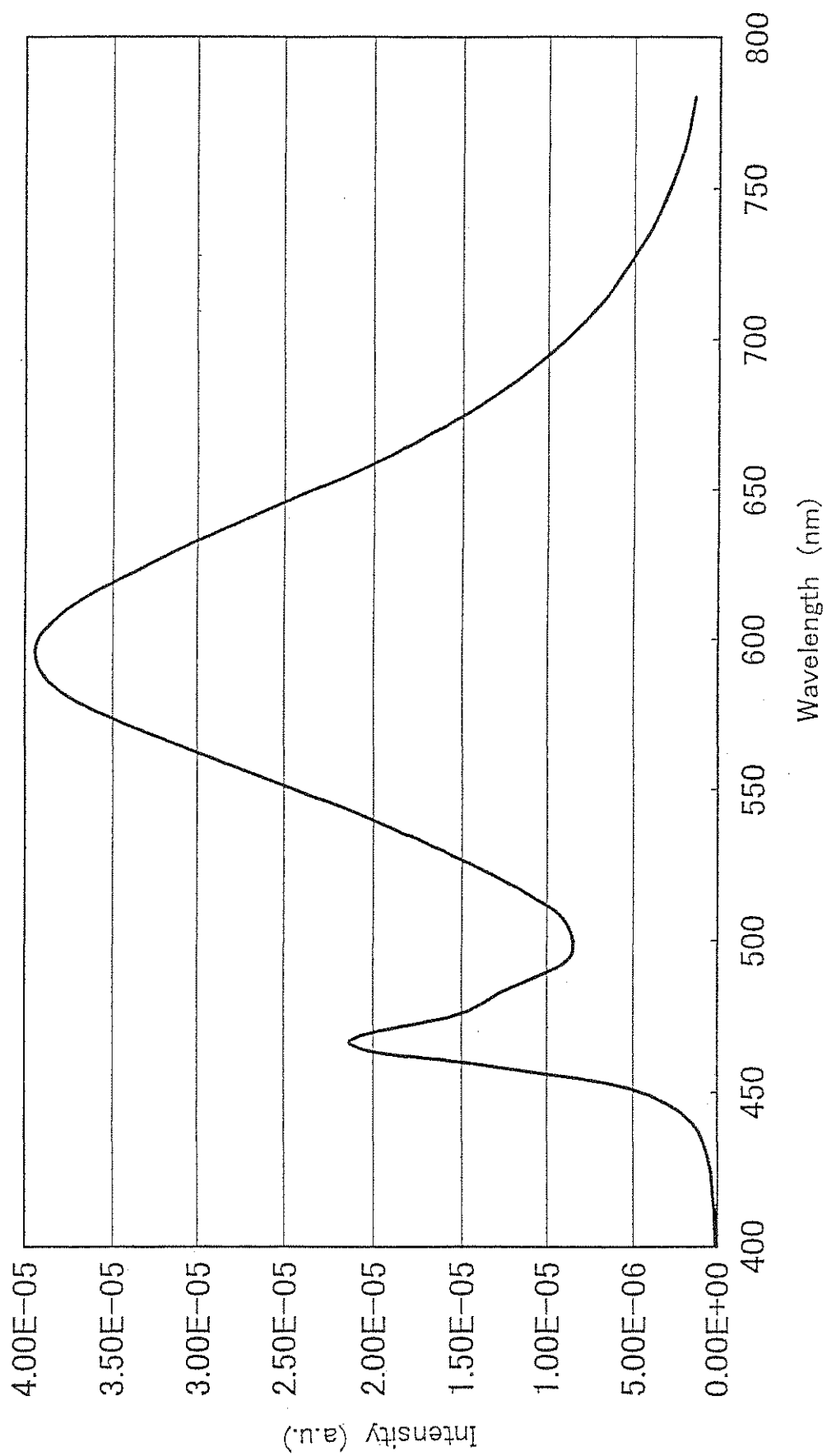


Fig. 41



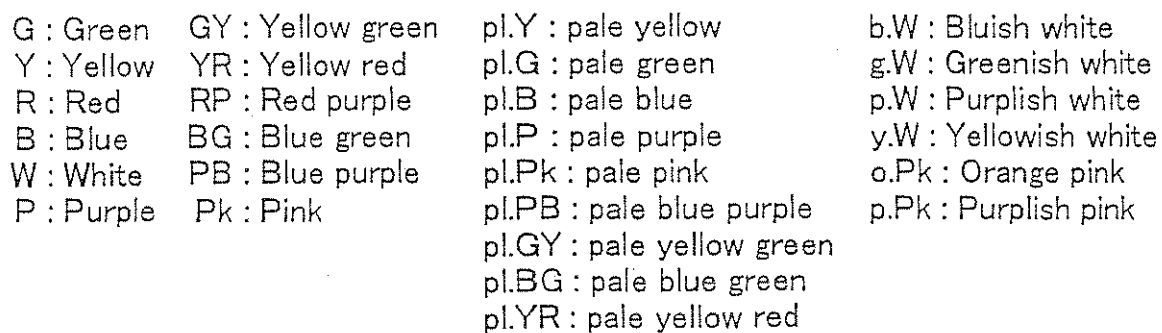
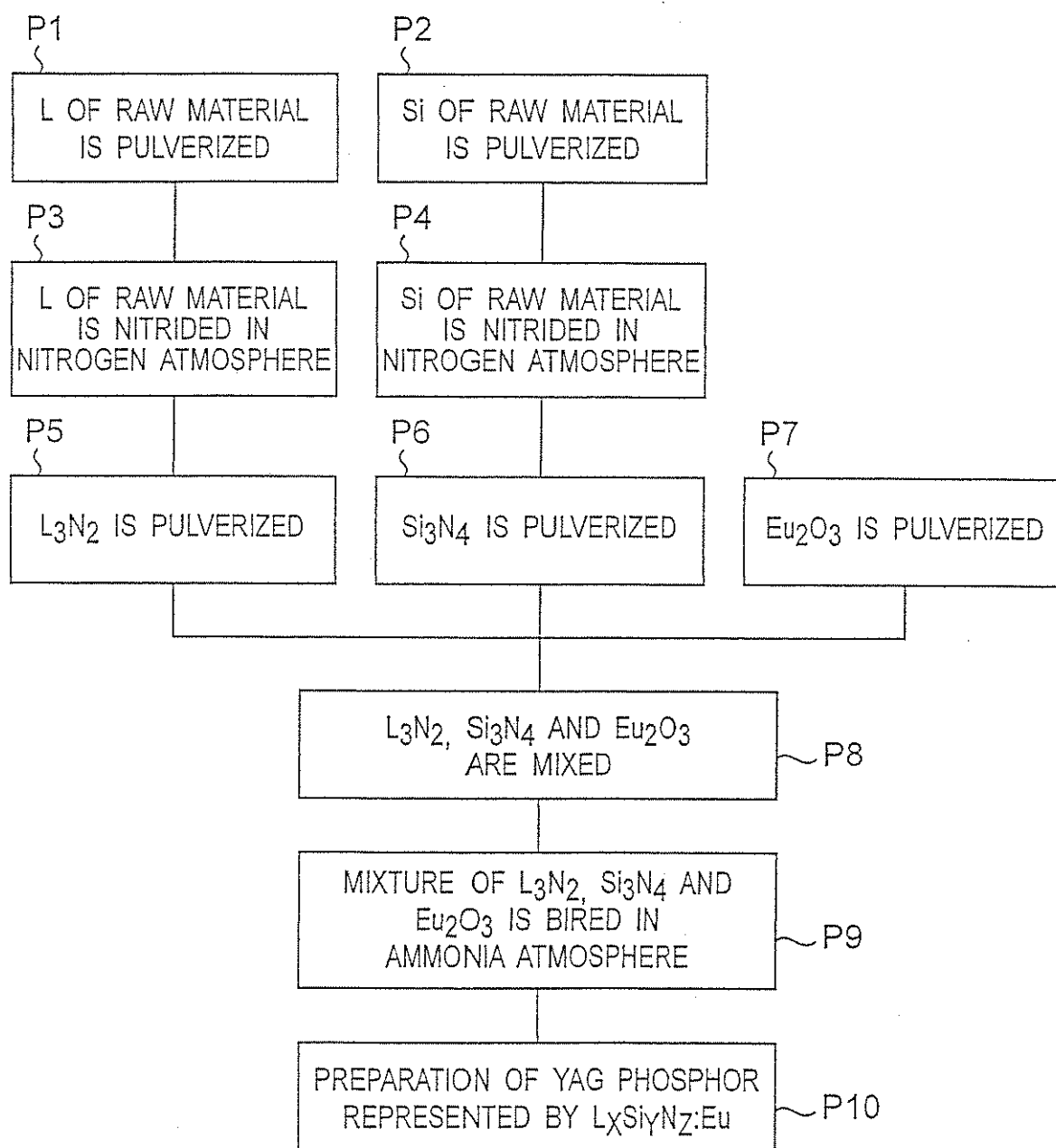
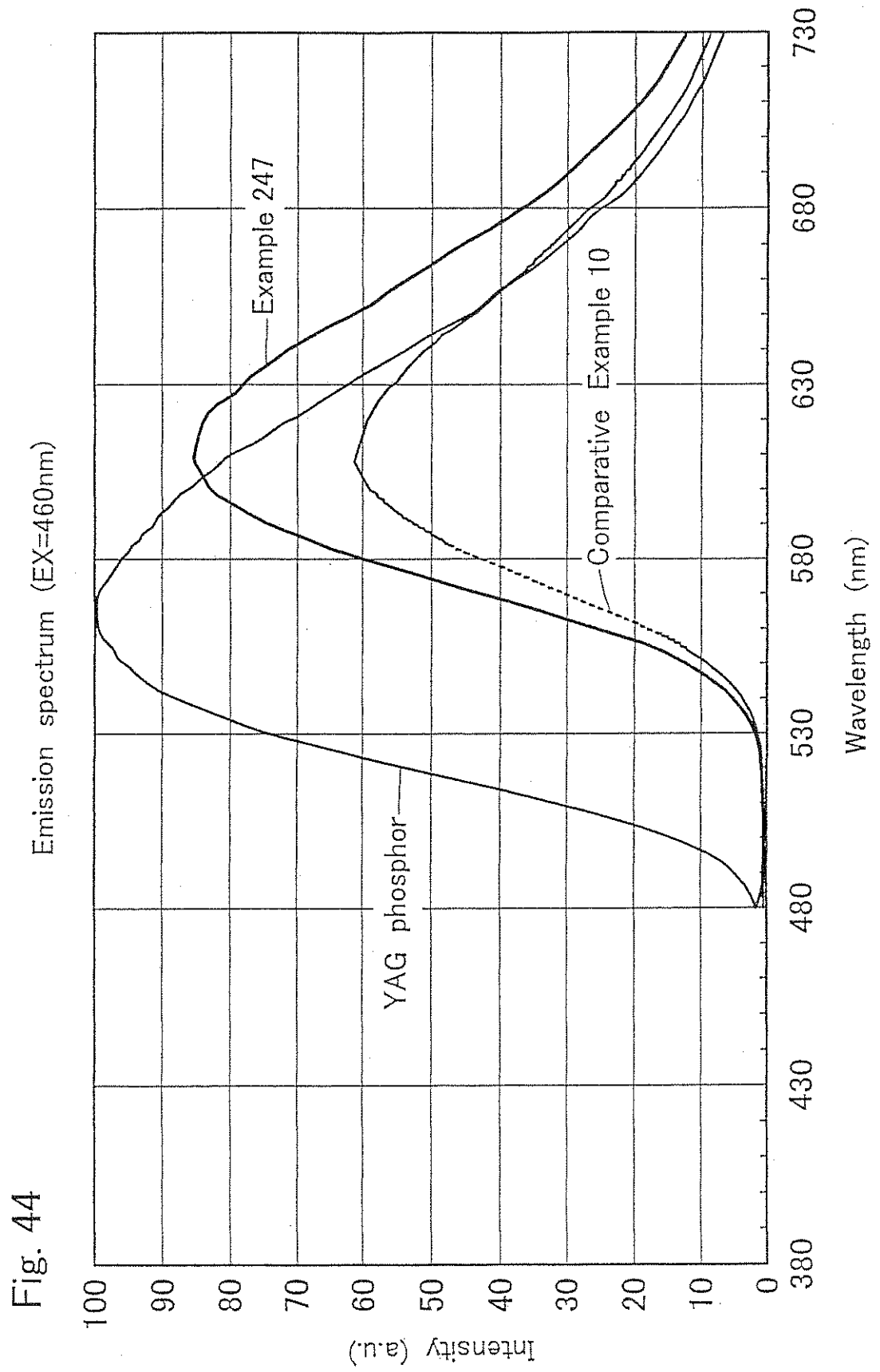


Fig.43





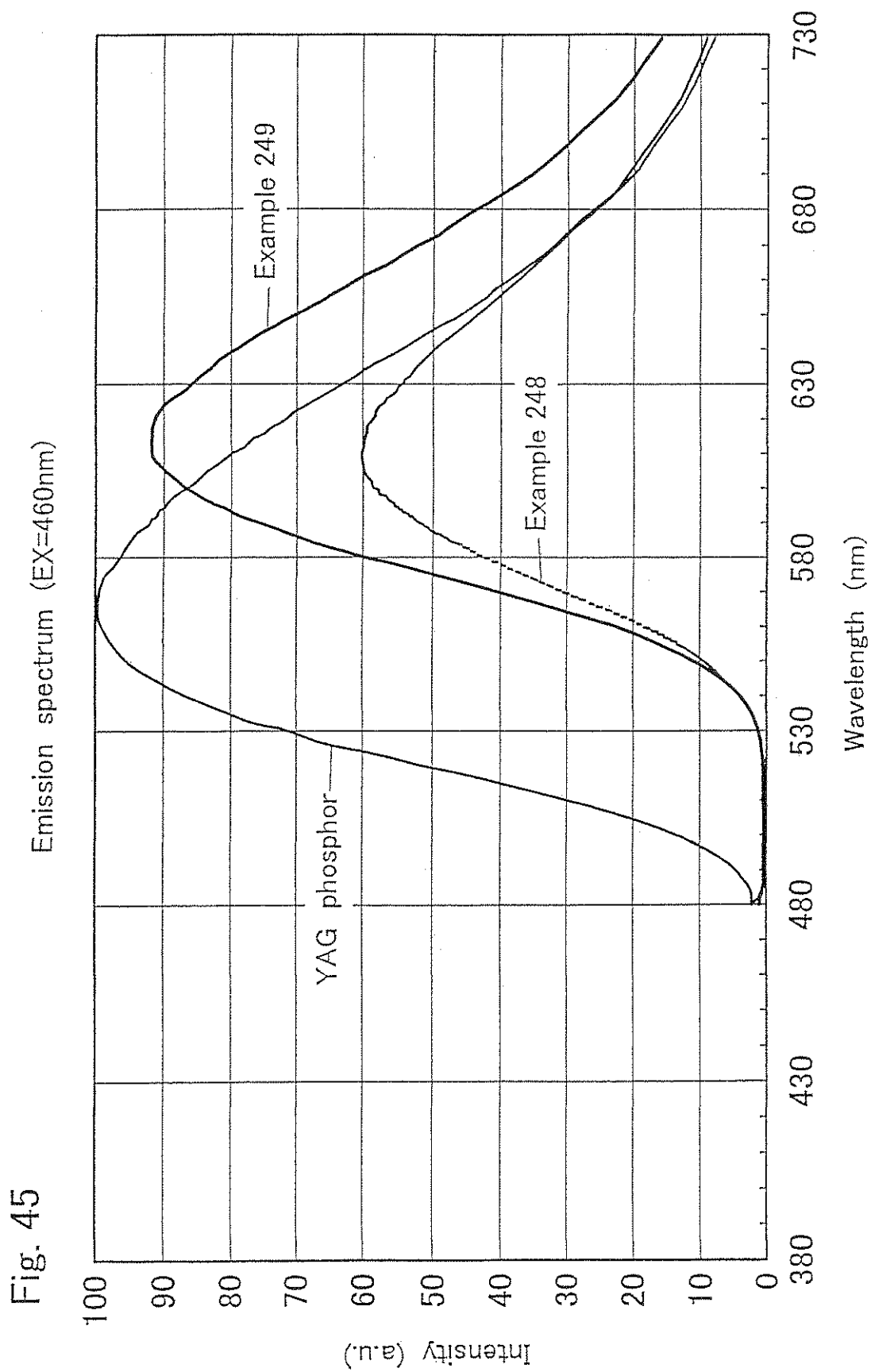
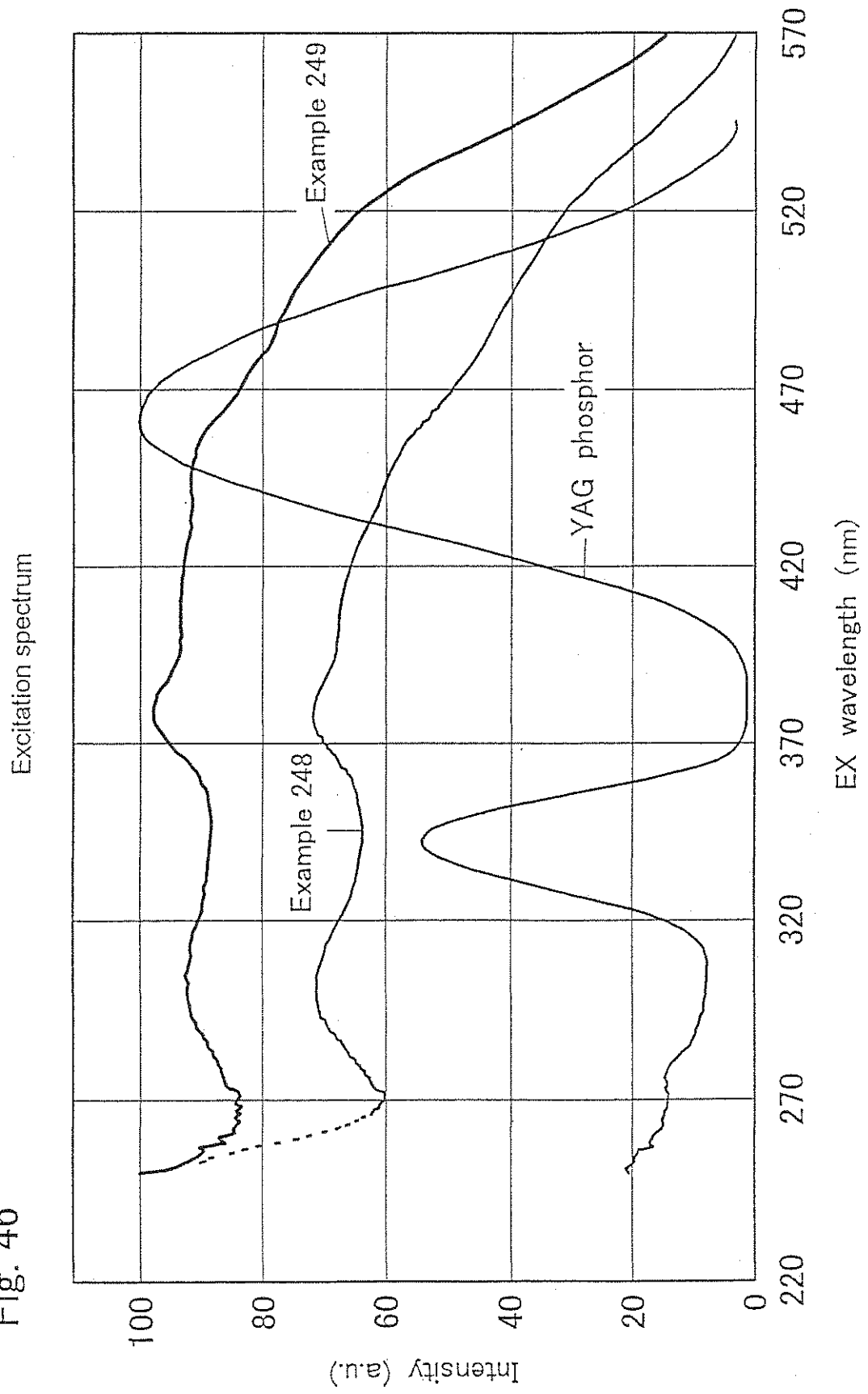
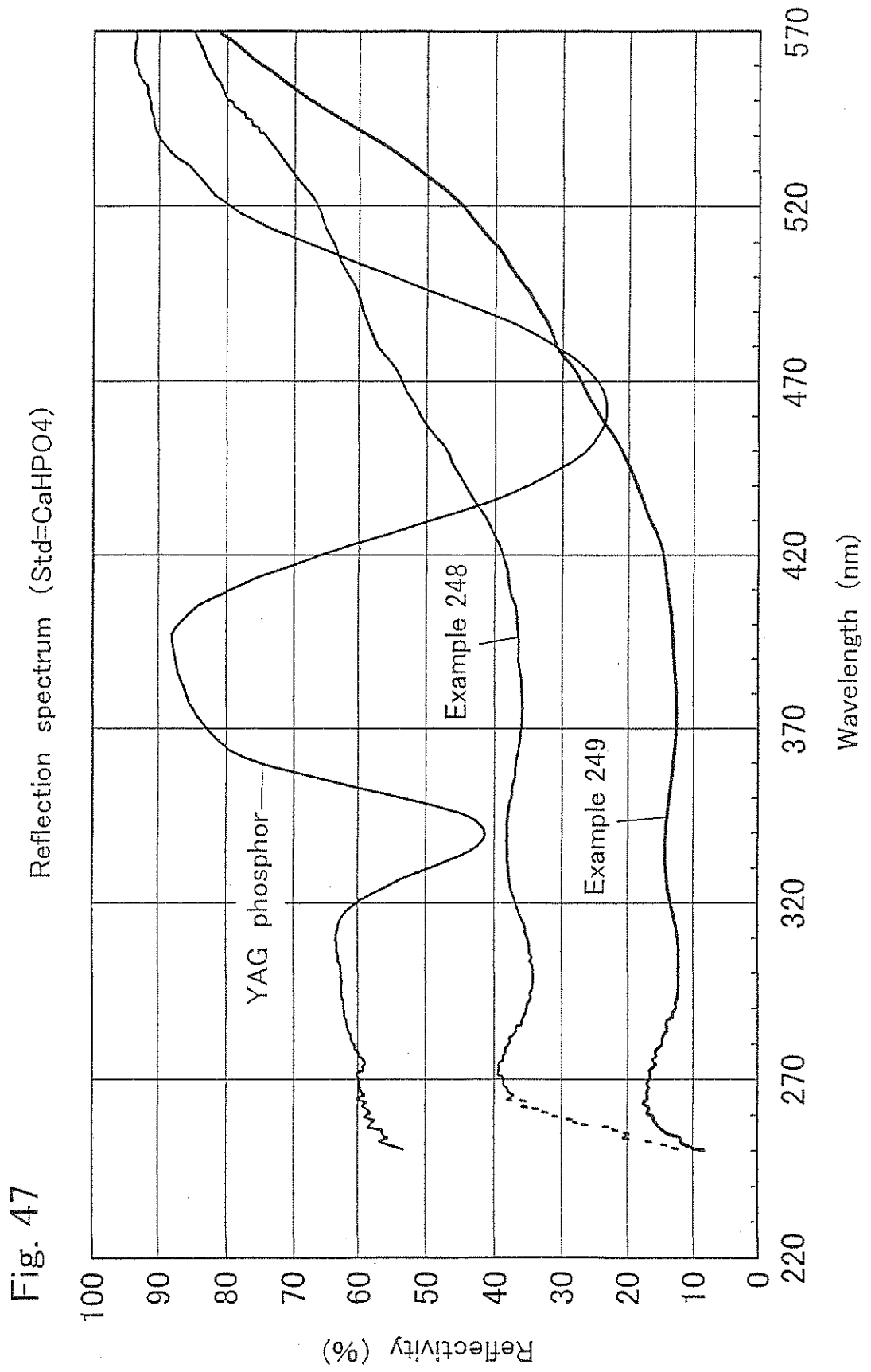
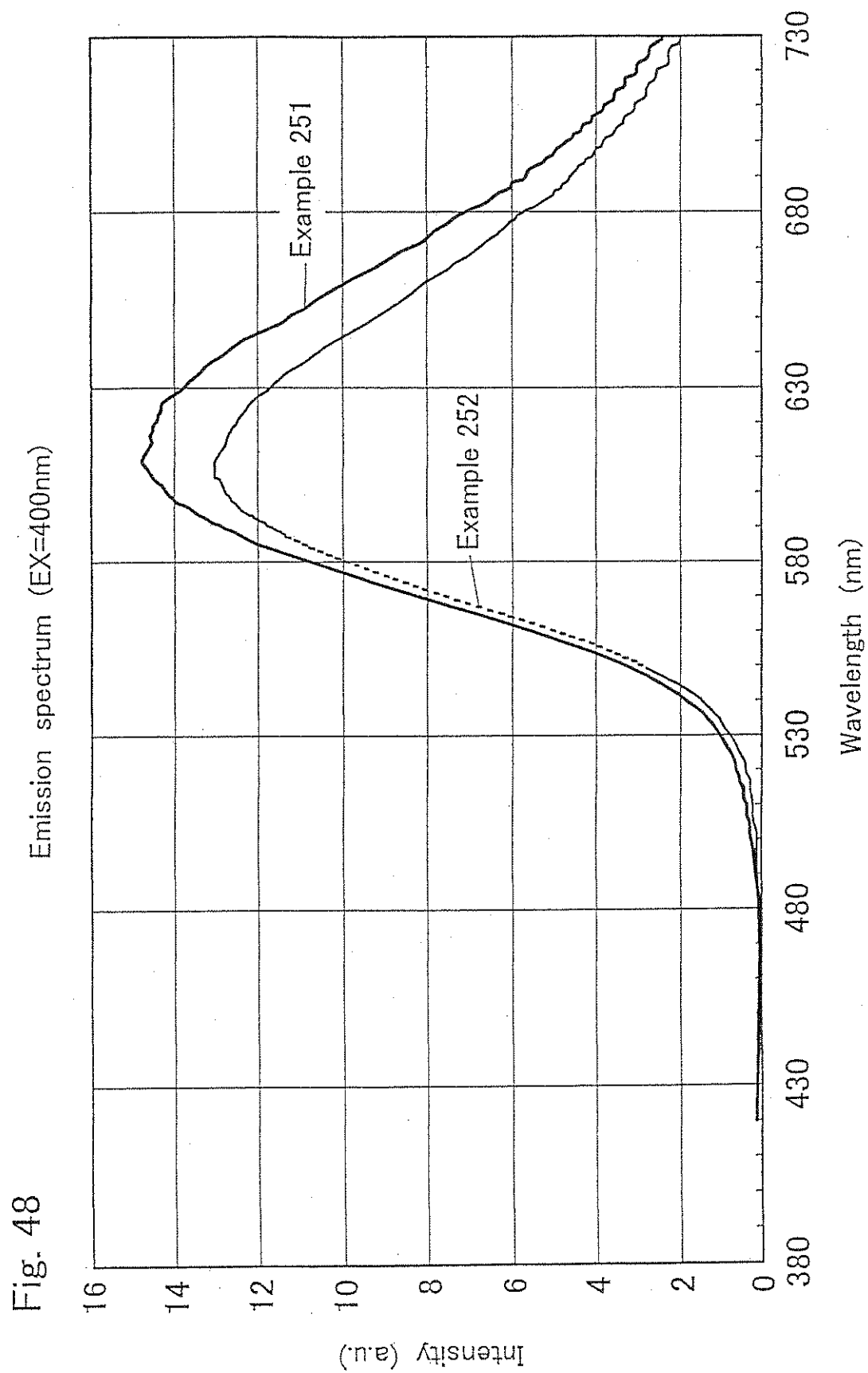
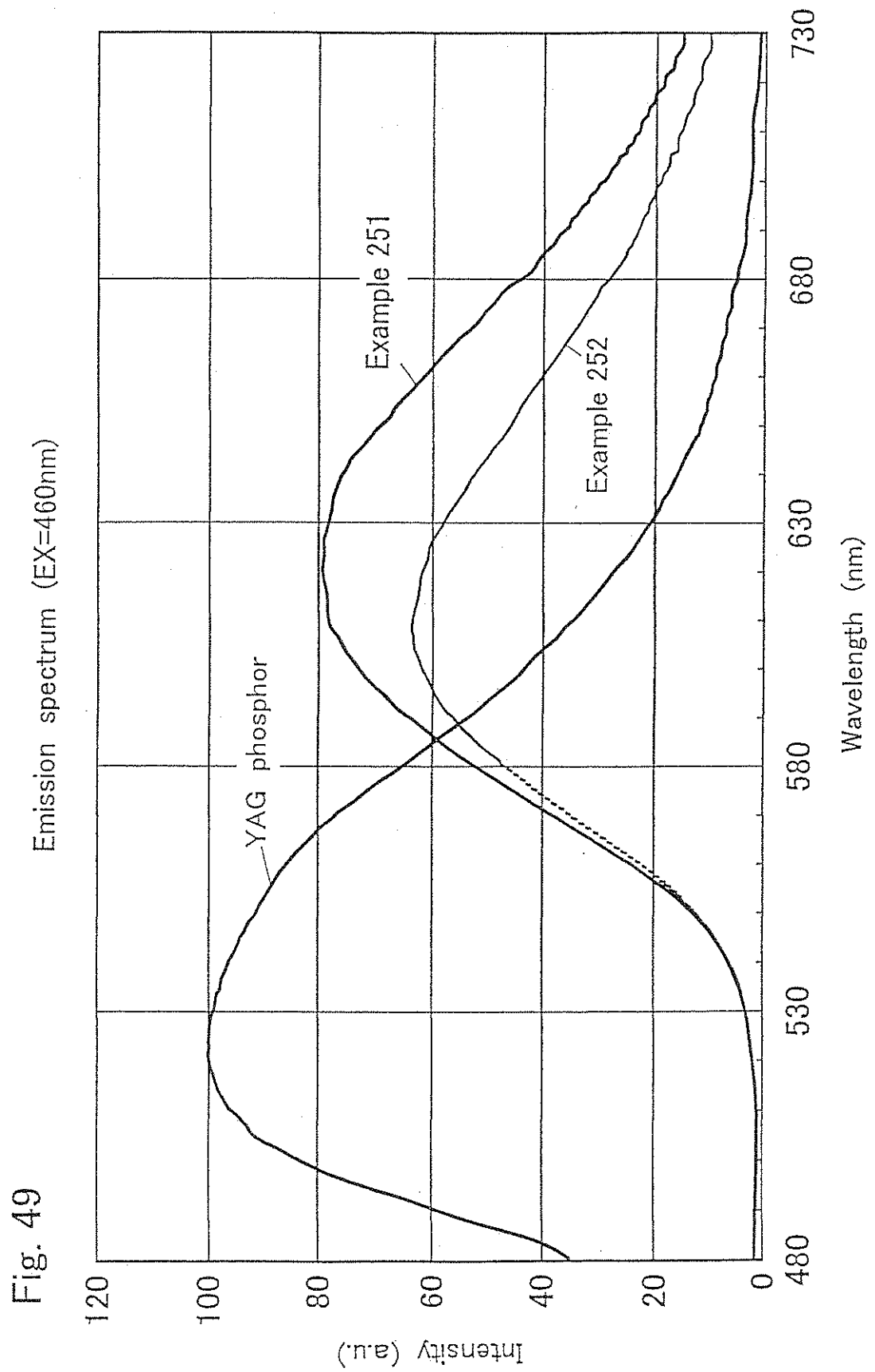


Fig. 46









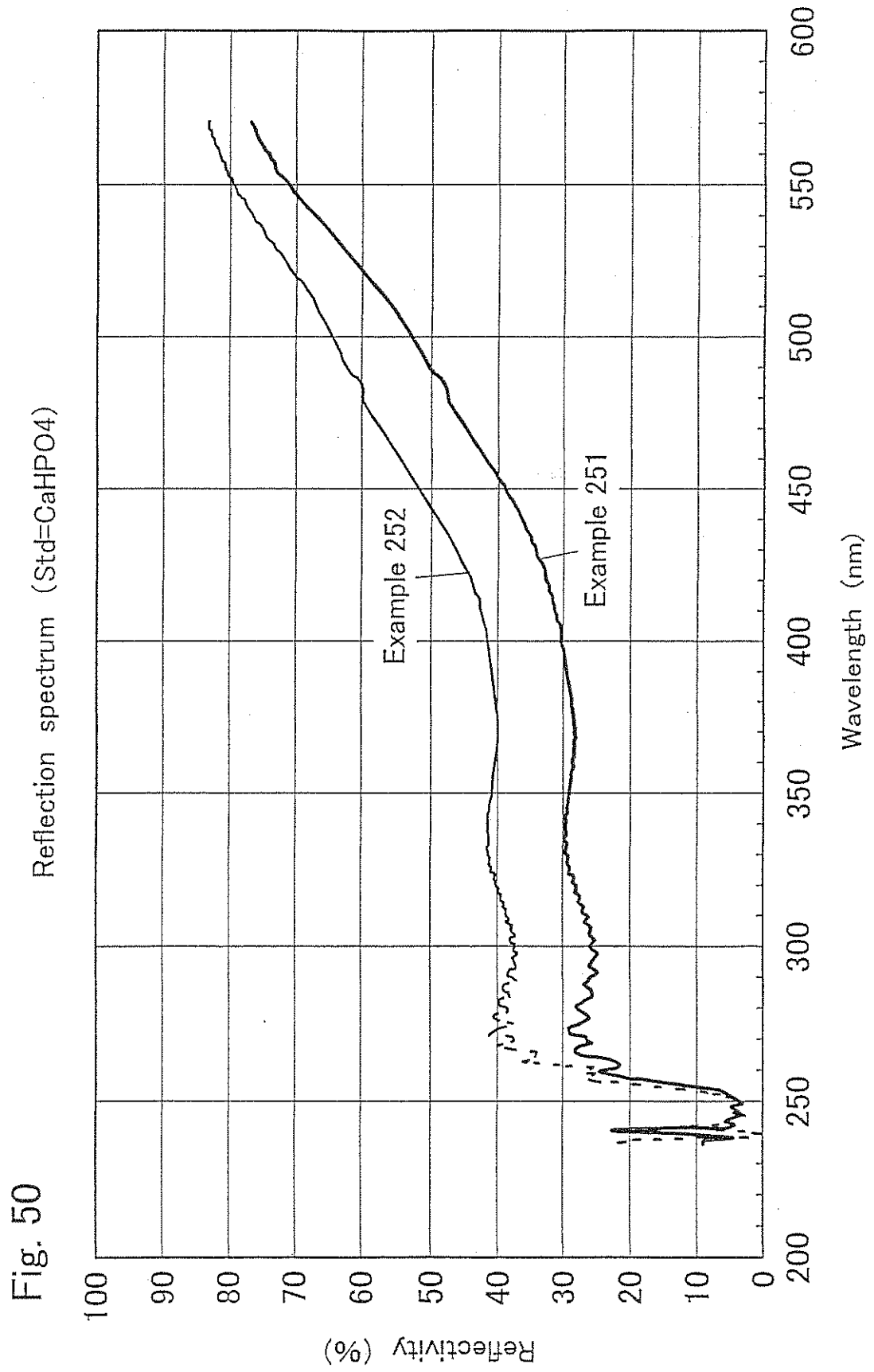
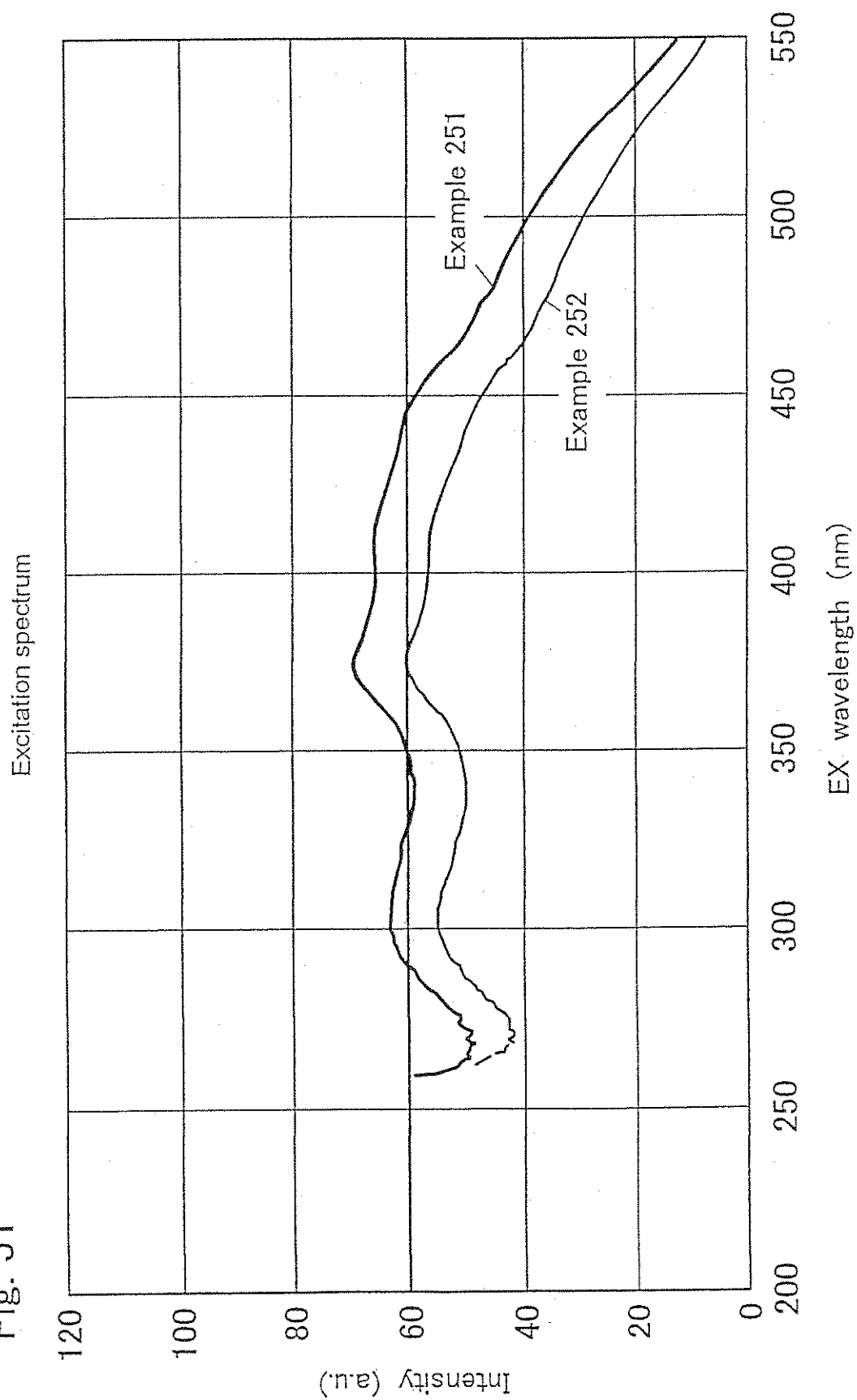


Fig. 51



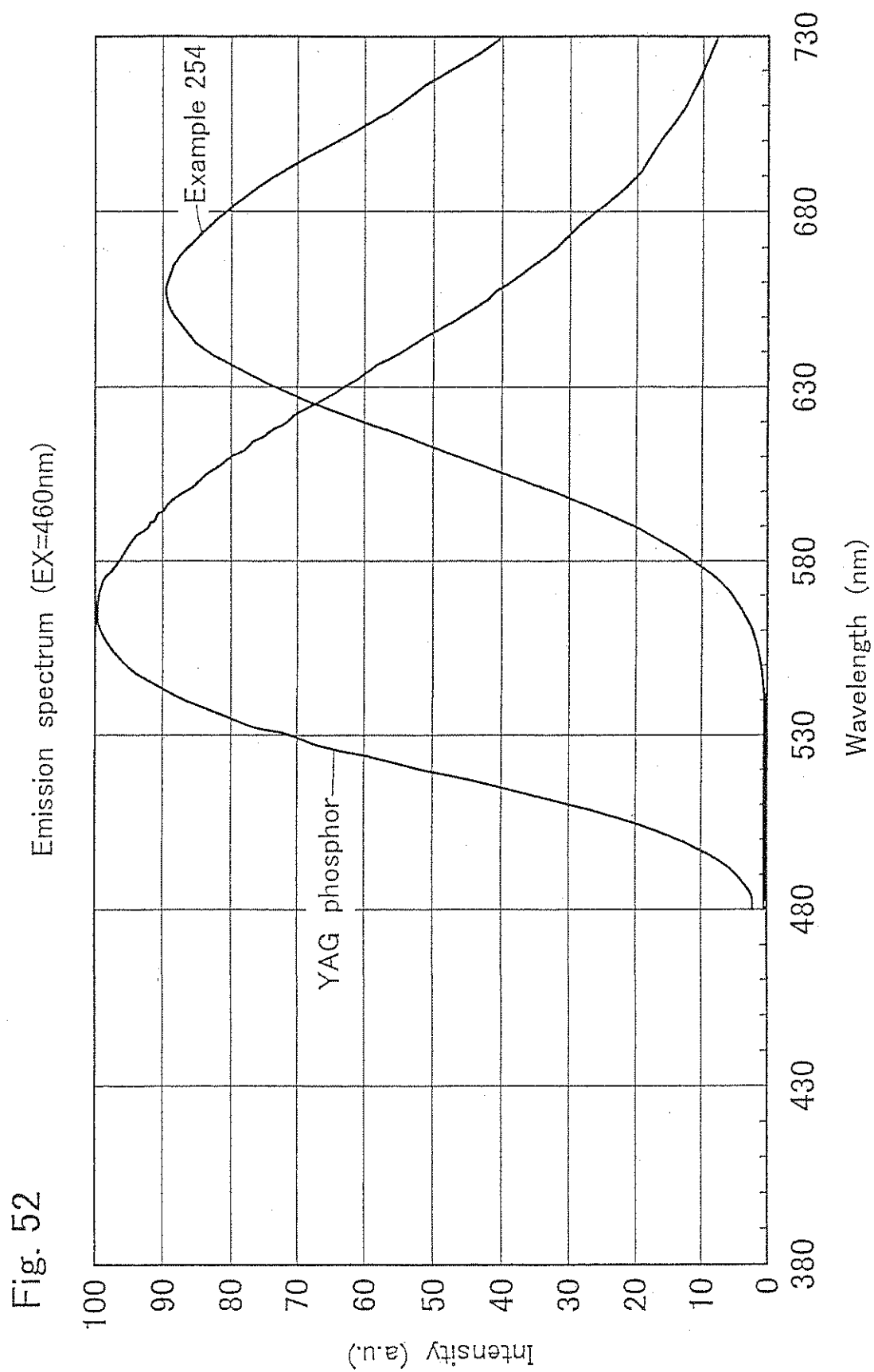


Fig. 53

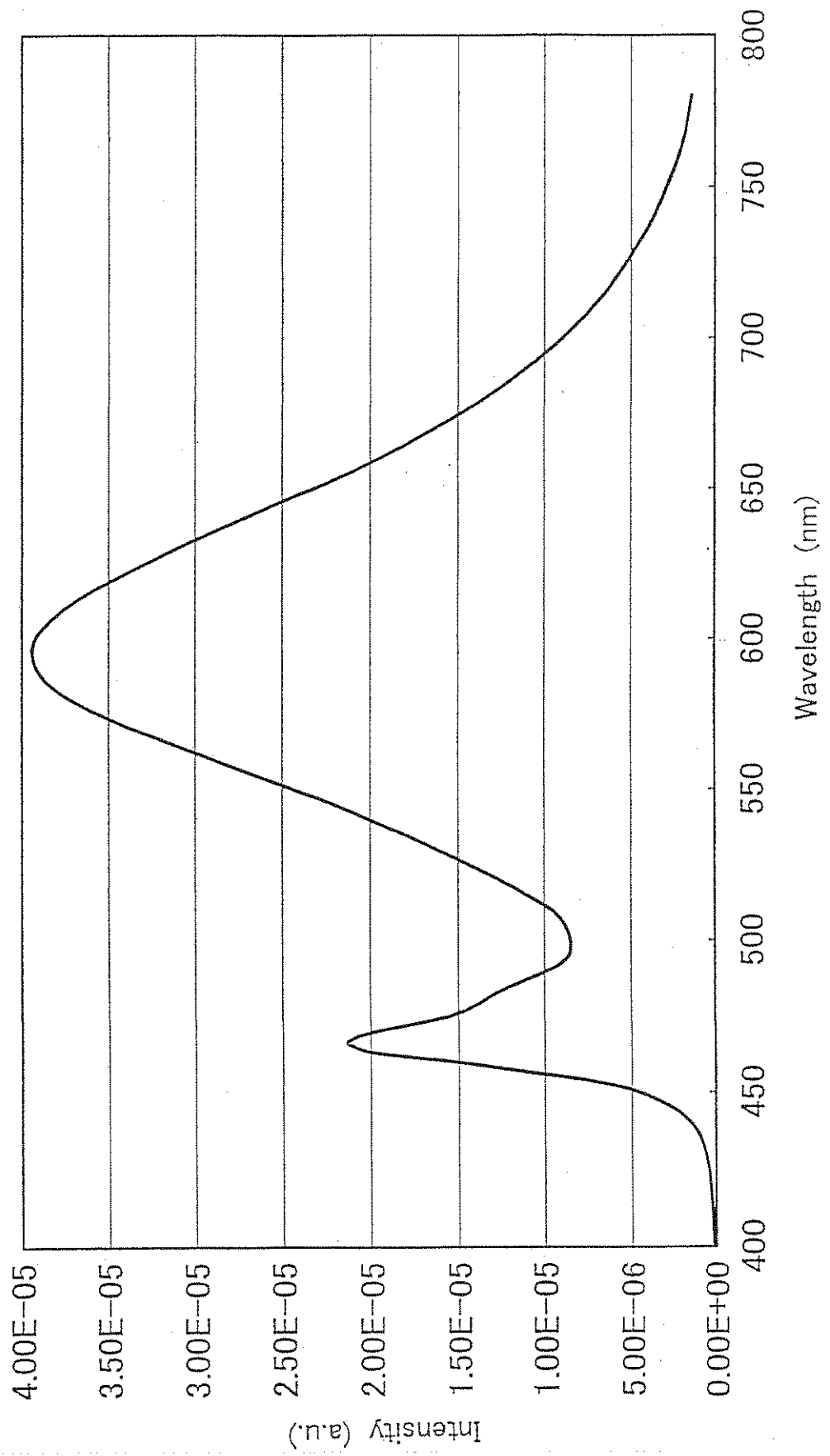
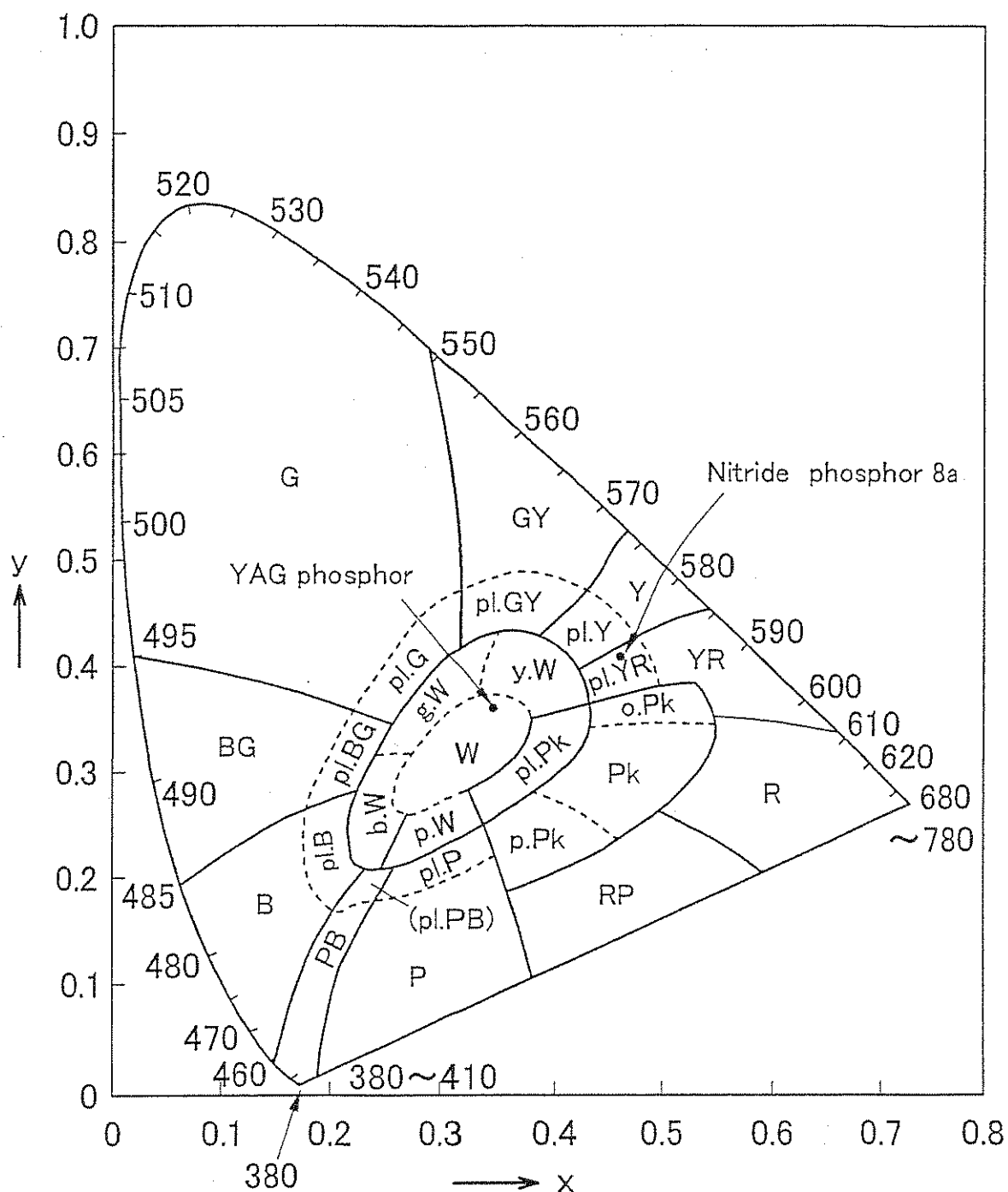


Fig. 54



G : Green	GY : Yellow green	pl.Y : pale yellow	b.W : Bluish white
Y : Yellow	YR : Yellow red	pl.G : pale green	g.W : Greenish white
R : Red	RP : Red purple	pl.B : pale blue	p.W : Purplish white
B : Blue	BG : Blue green	pl.P : pale purple	y.W : Yellowish white
W : White	PB : Blue purple	pl.Pk : pale pink	o.Pk : Orange pink
P : Purple	Pk : Pink	pl.PB : pale blue purple	p.Pk : Purplish pink
		pl.GY : pale yellow green	
		pl.BG : pale blue green	
		pl.YR : pale yellow red	

Fig. 55

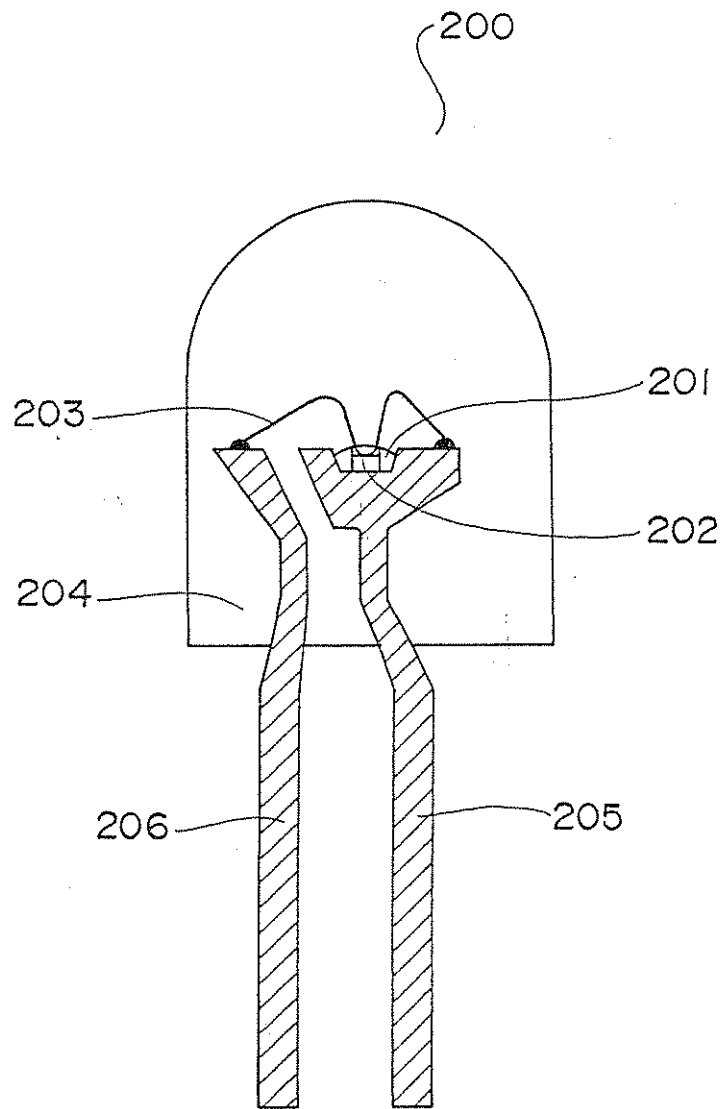
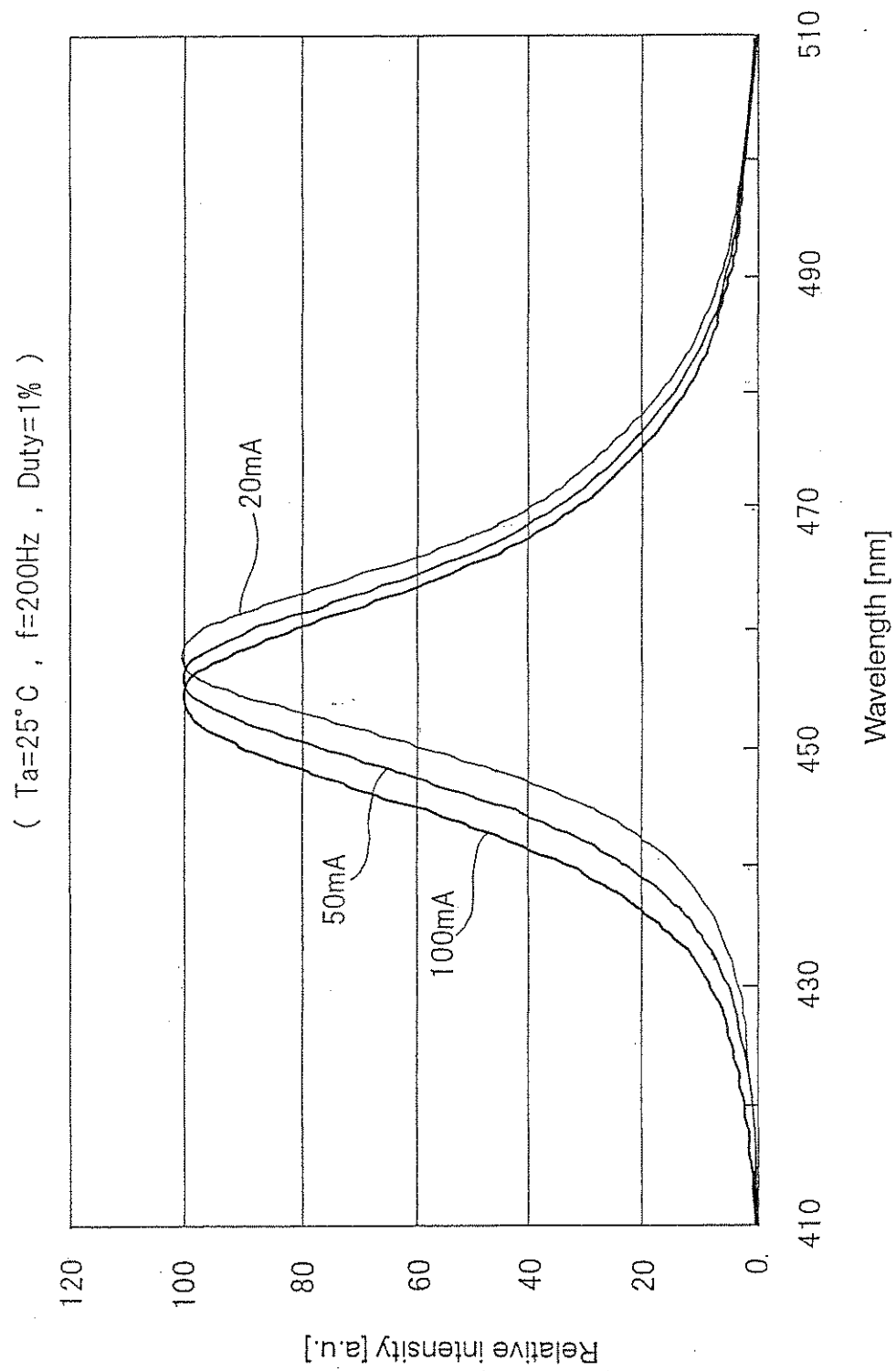
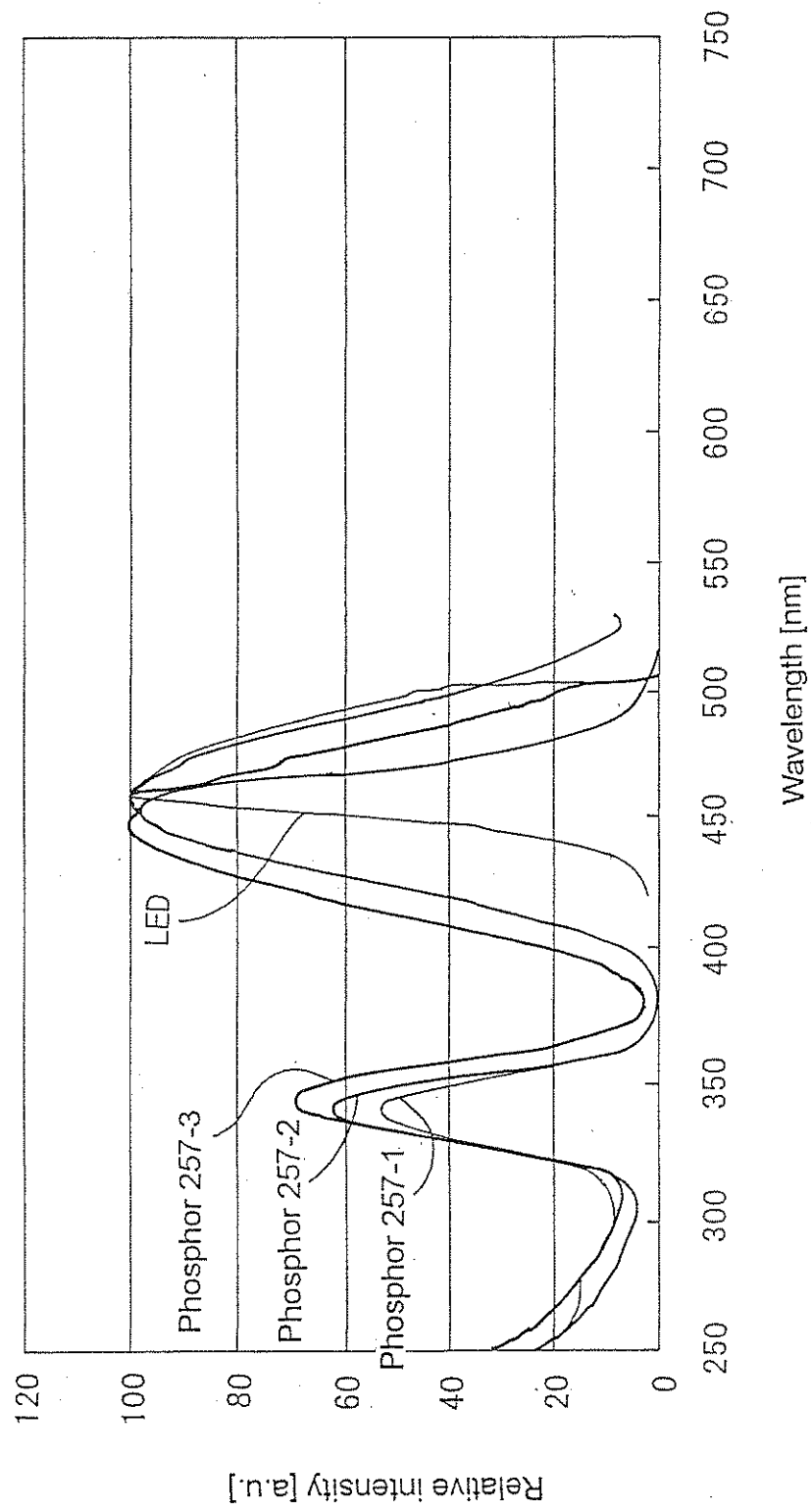


Fig. 56



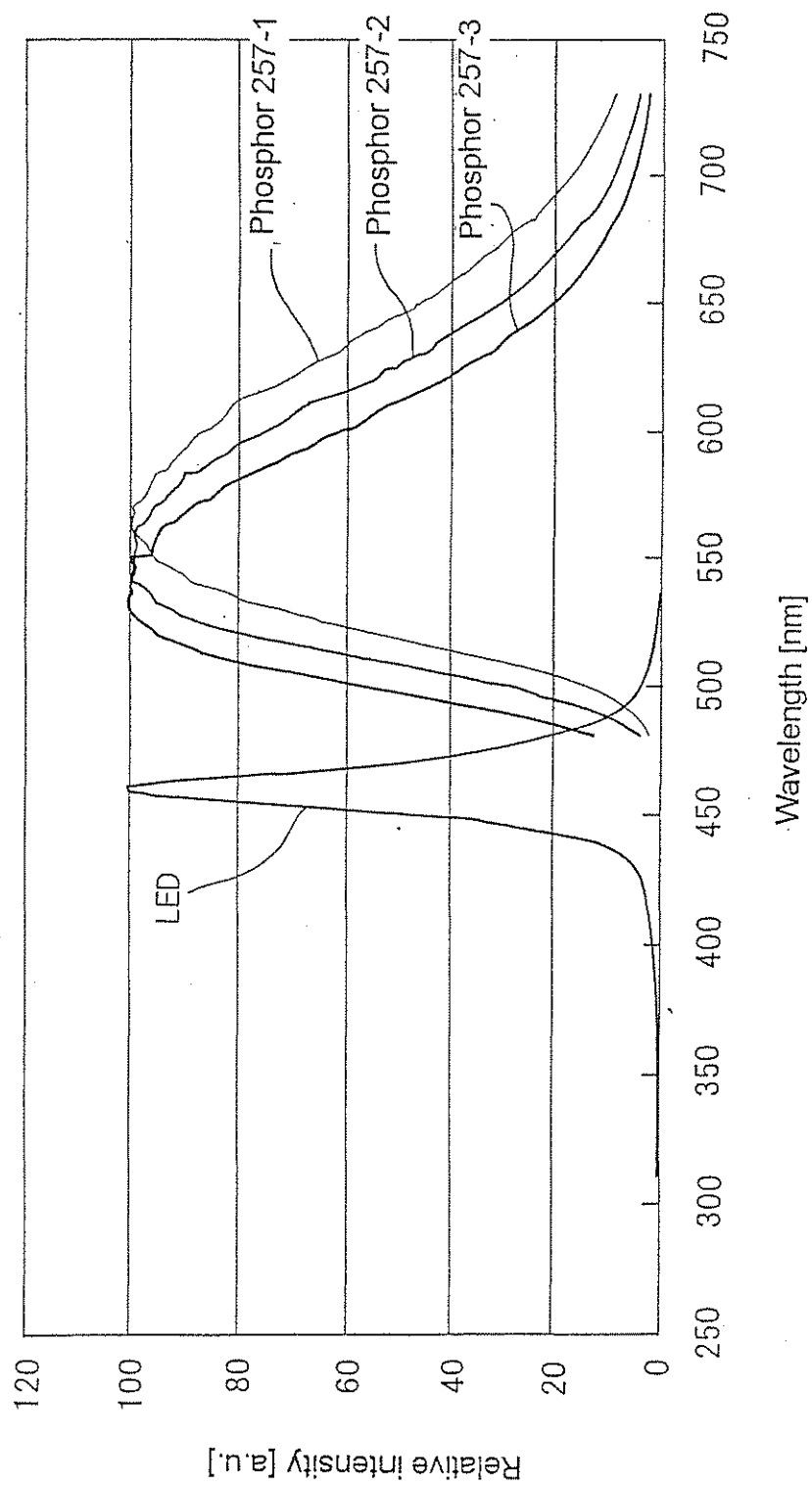
Electric current - relative luminescence spectra of LED of 460nm for exciting a phosphor

Fig. 57



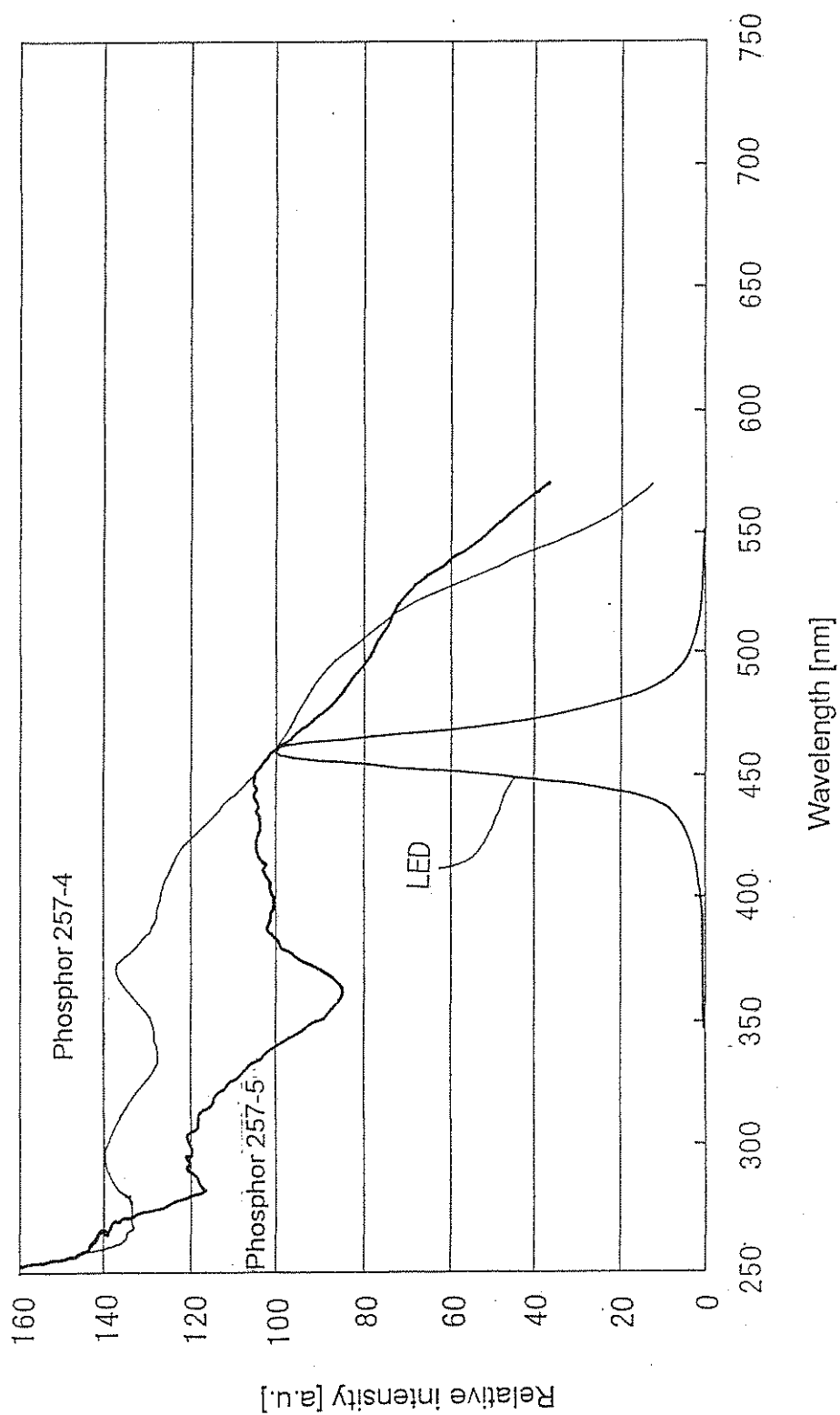
Excitation absorption spectra of YAG-base phosphors

Fig. 58



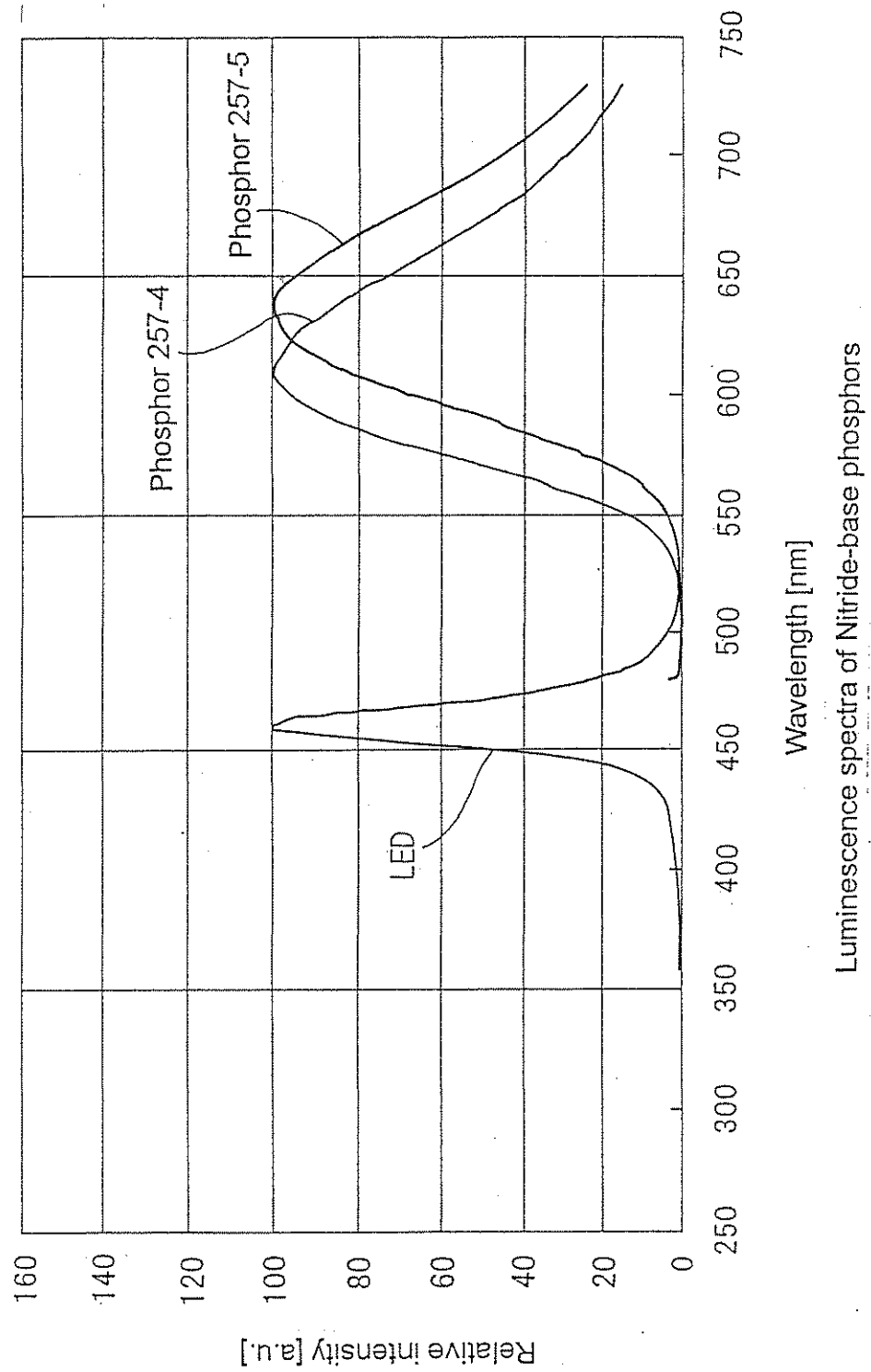
Luminescence spectra of YAG-base phosphors

Fig. 59



Excitation absorption spectra of Nitride-base phosphors

Fig. 60



White LED + Chromaticity added red - Ambient temperature property
 ($I_{fp}=20\text{mA}$, $f=200\text{Hz}$, Duty=1%)

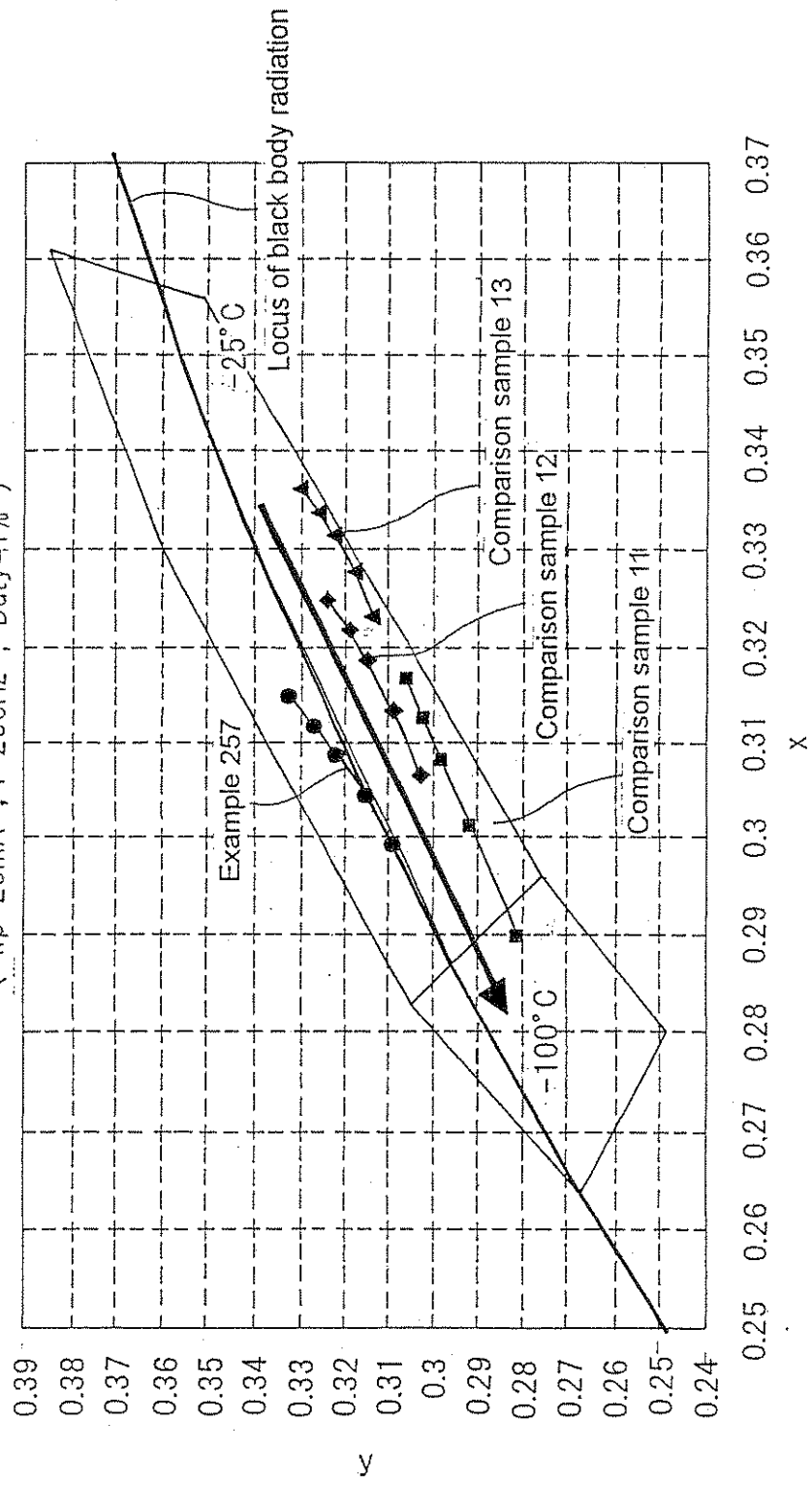


Fig. 61

Fig. 62

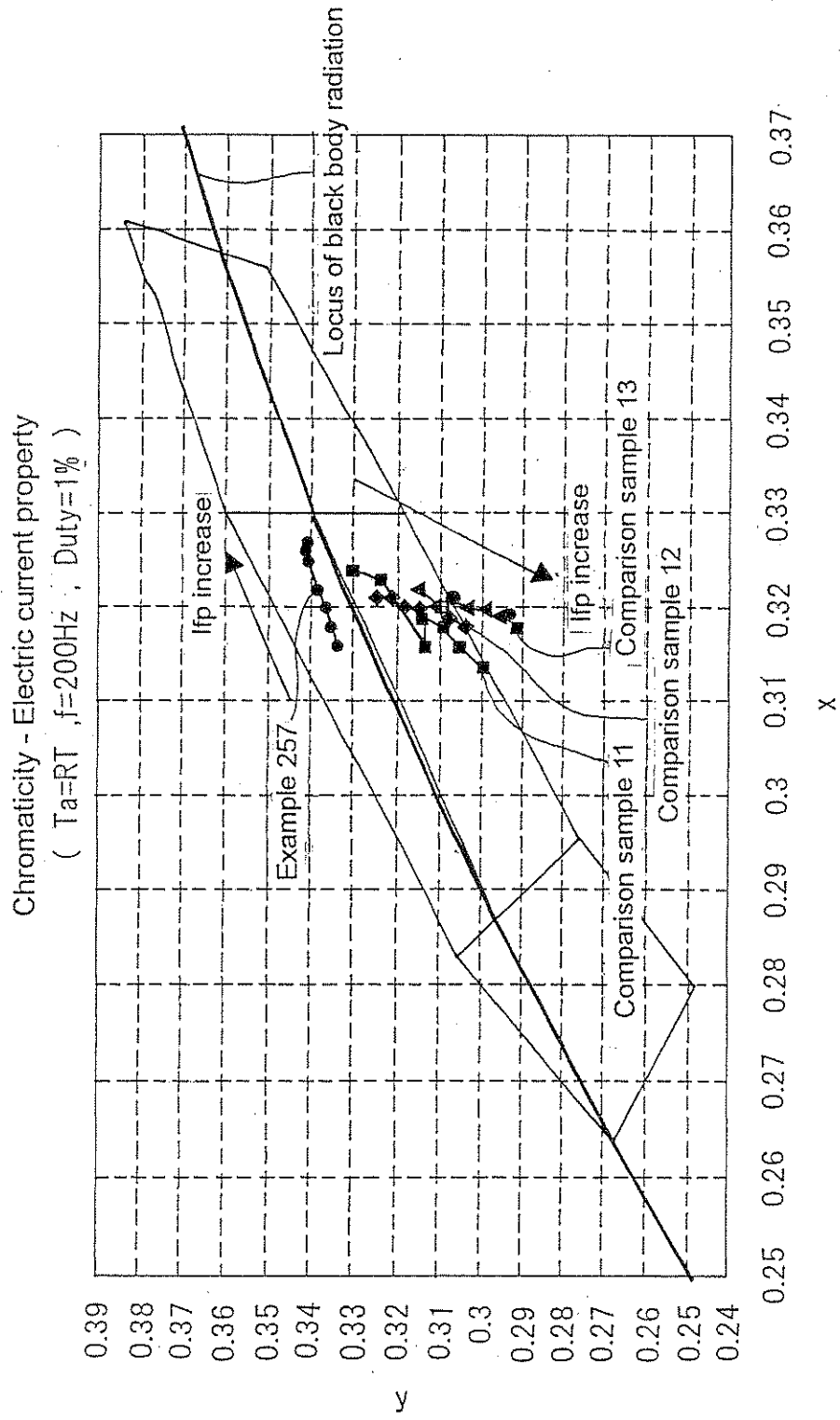


Fig. 63

White LED + Electric current - Chromaticity diagram of Chromaticity added red
 (If=1, 5, 10, 20, 40, 60, [mA]. Ta=RT. measurement by DC)

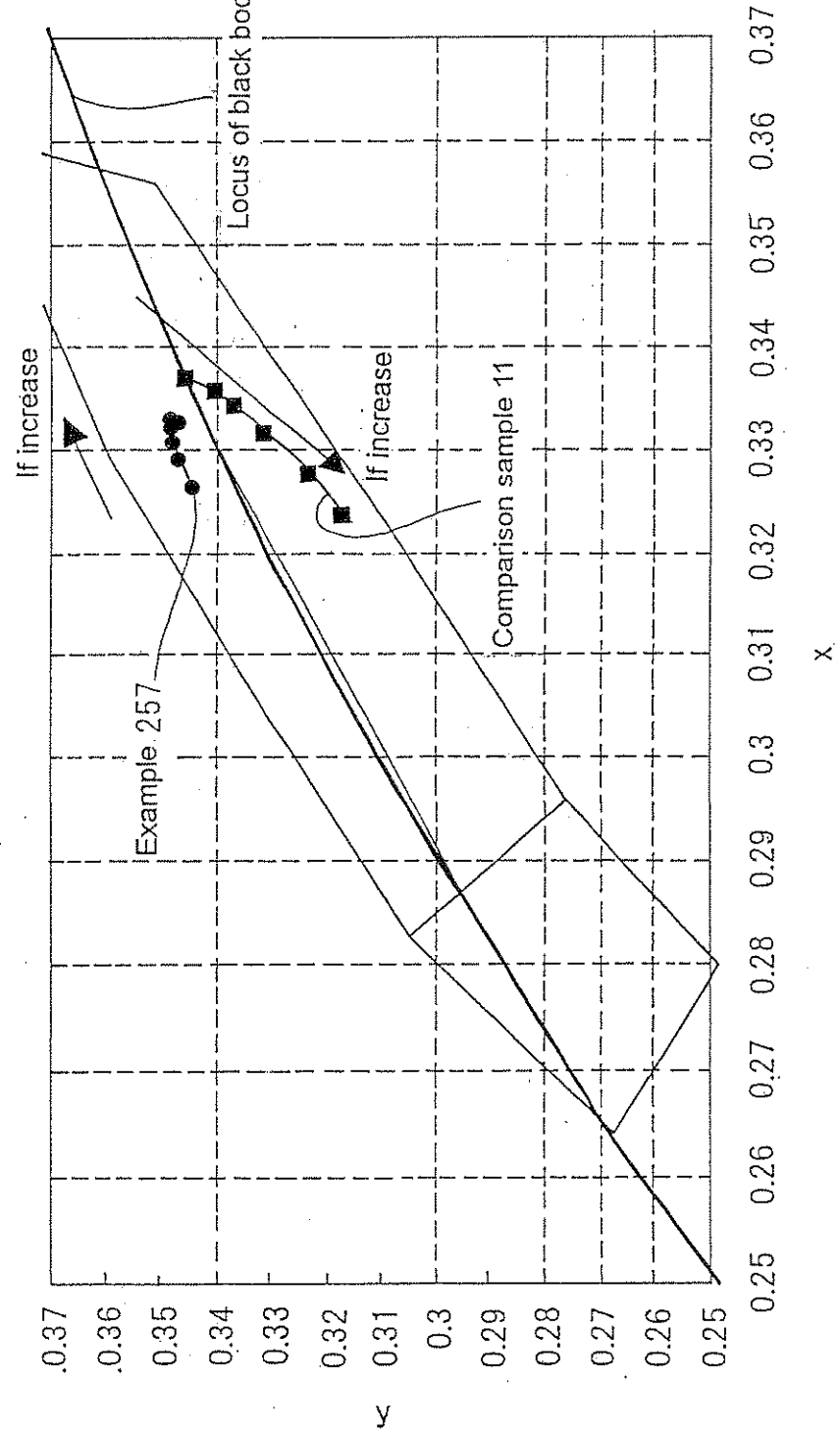


Fig. 64

Ambient temperature - Relative light output of the phosphor 257-1
(Ifp=20mA. F=200Hz. Duty=1%)

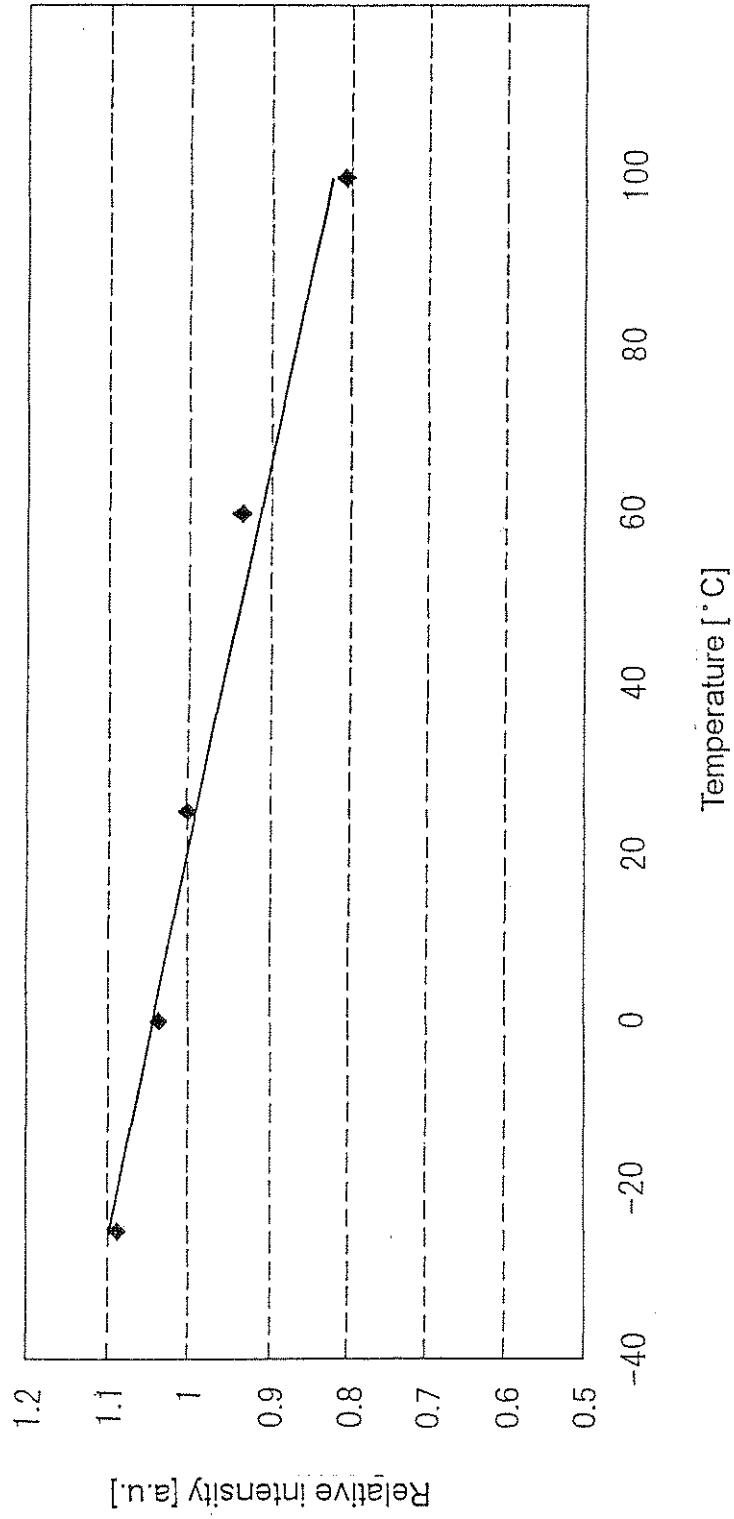


Fig. 65

Ambient temperature - Relative light output of the phosphor 257-2
($I_{fp}=20\text{mA}$. $F=200\text{Hz}$. Duty=1%)

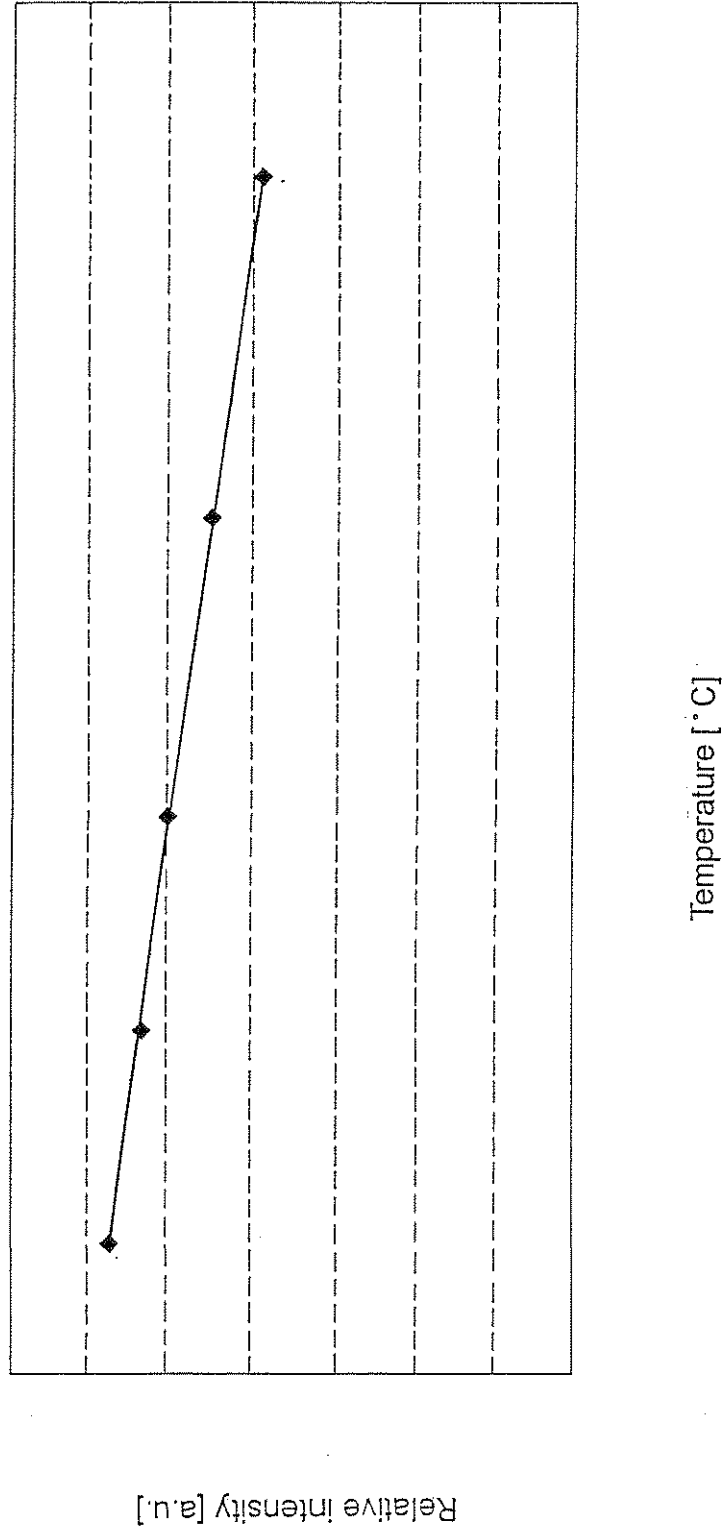


Fig. 66

Ambient temperature - Relative light output of the phosphor 257-3
($I_{fp}=20\text{ mA}$, $F=200\text{ Hz}$, Duty=1%)

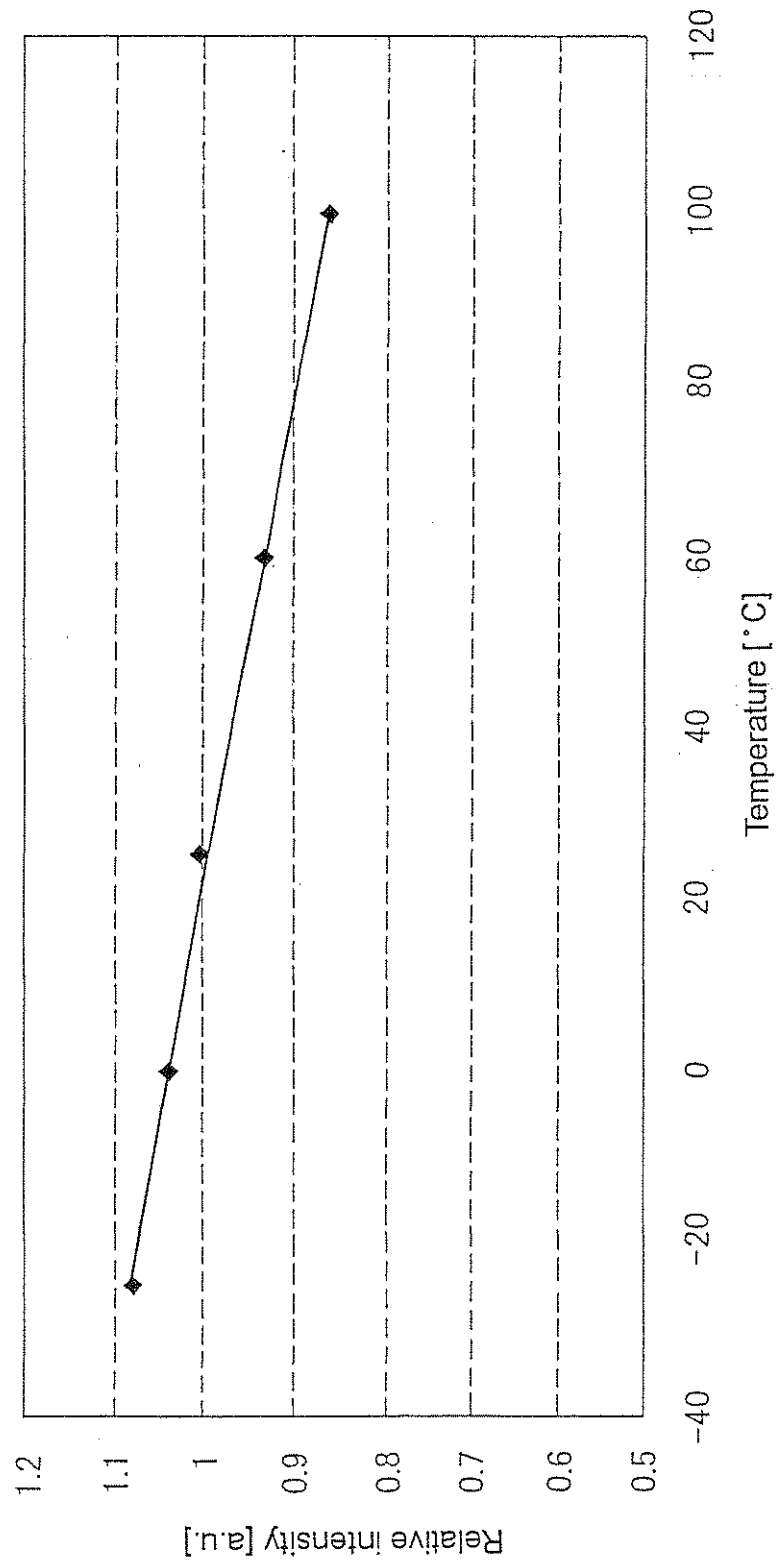


Fig. 67

Ambient temperature - Relative light output of the phosphor 257-4
($I_{fp}=20\text{mA}$, $F=200\text{Hz}$, Duty=1%)

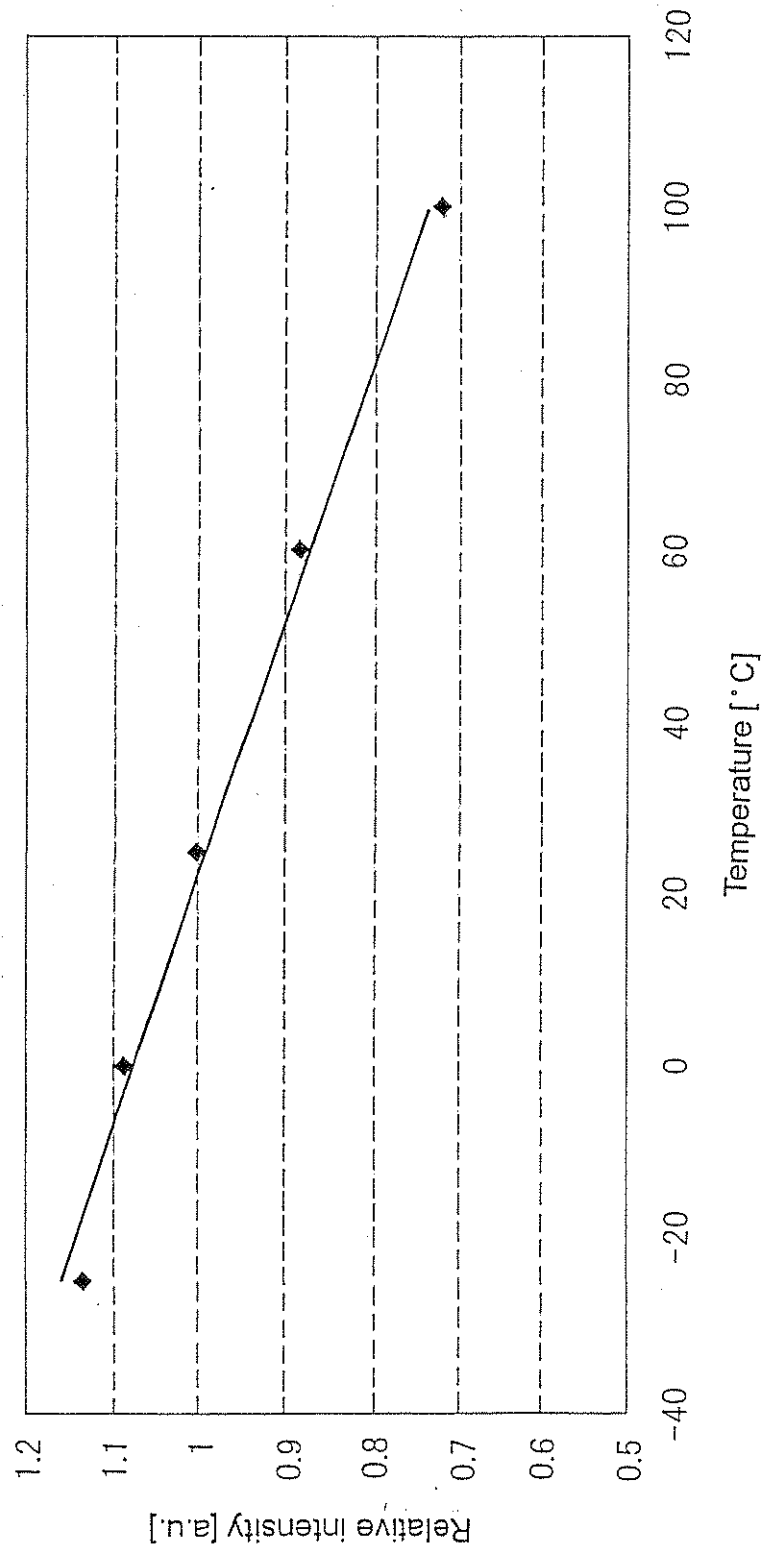


Fig. 68

Ambient temperature - Relative light output of the phosphor 257-5

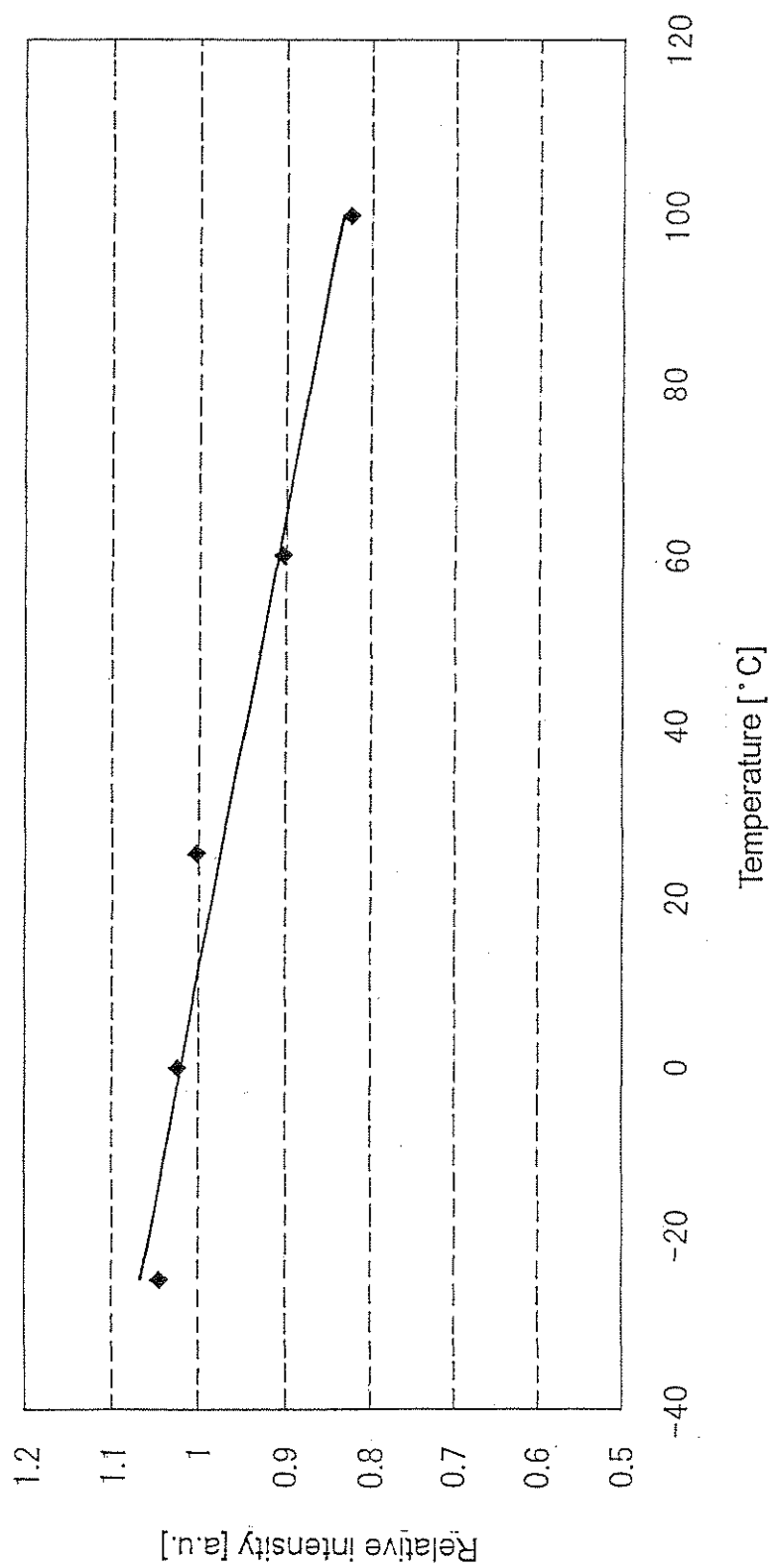
($I_{fp}=20\text{mA}$, $f=200\text{Hz}$, Duty=1%)

Fig. 69

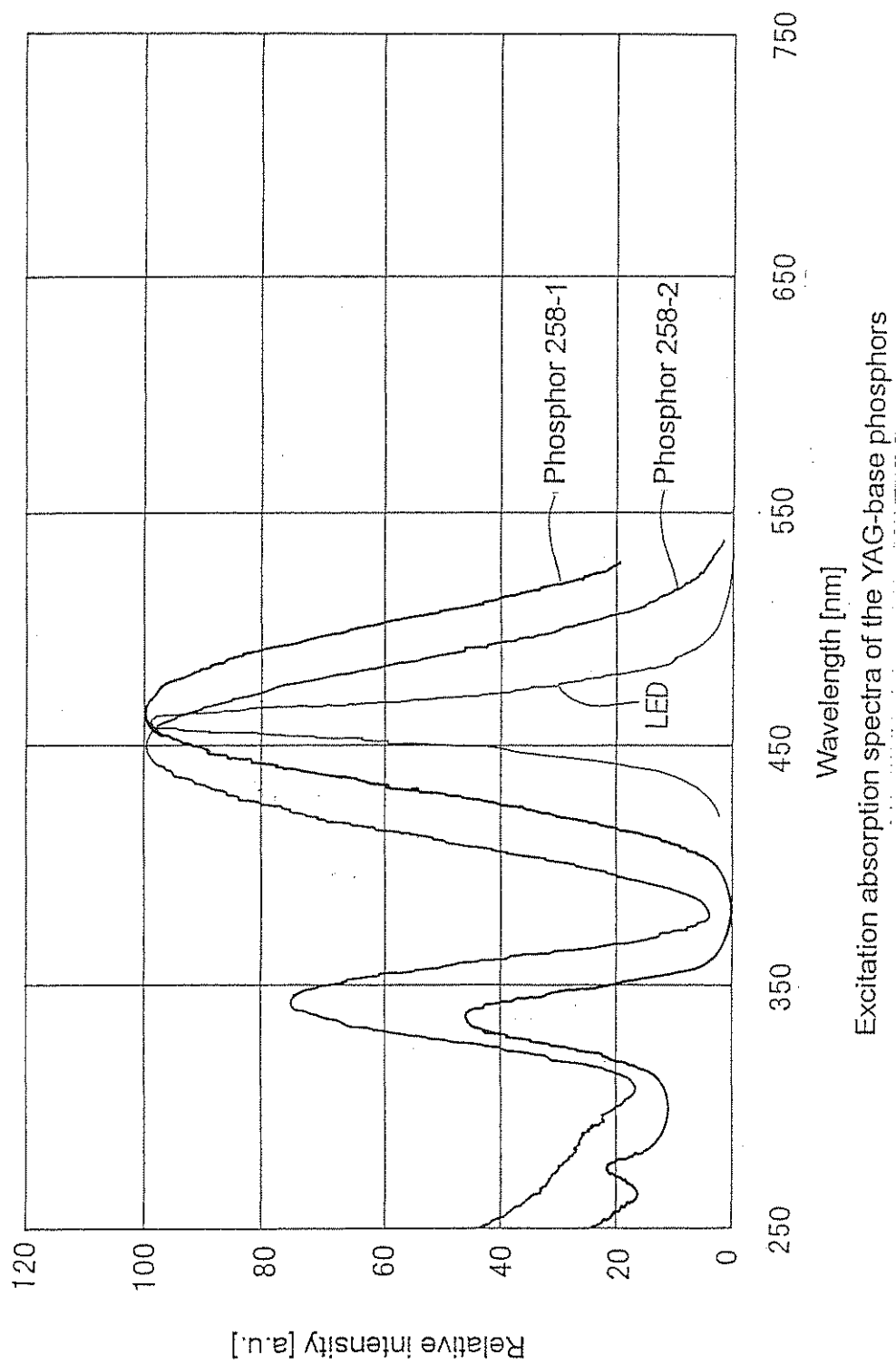
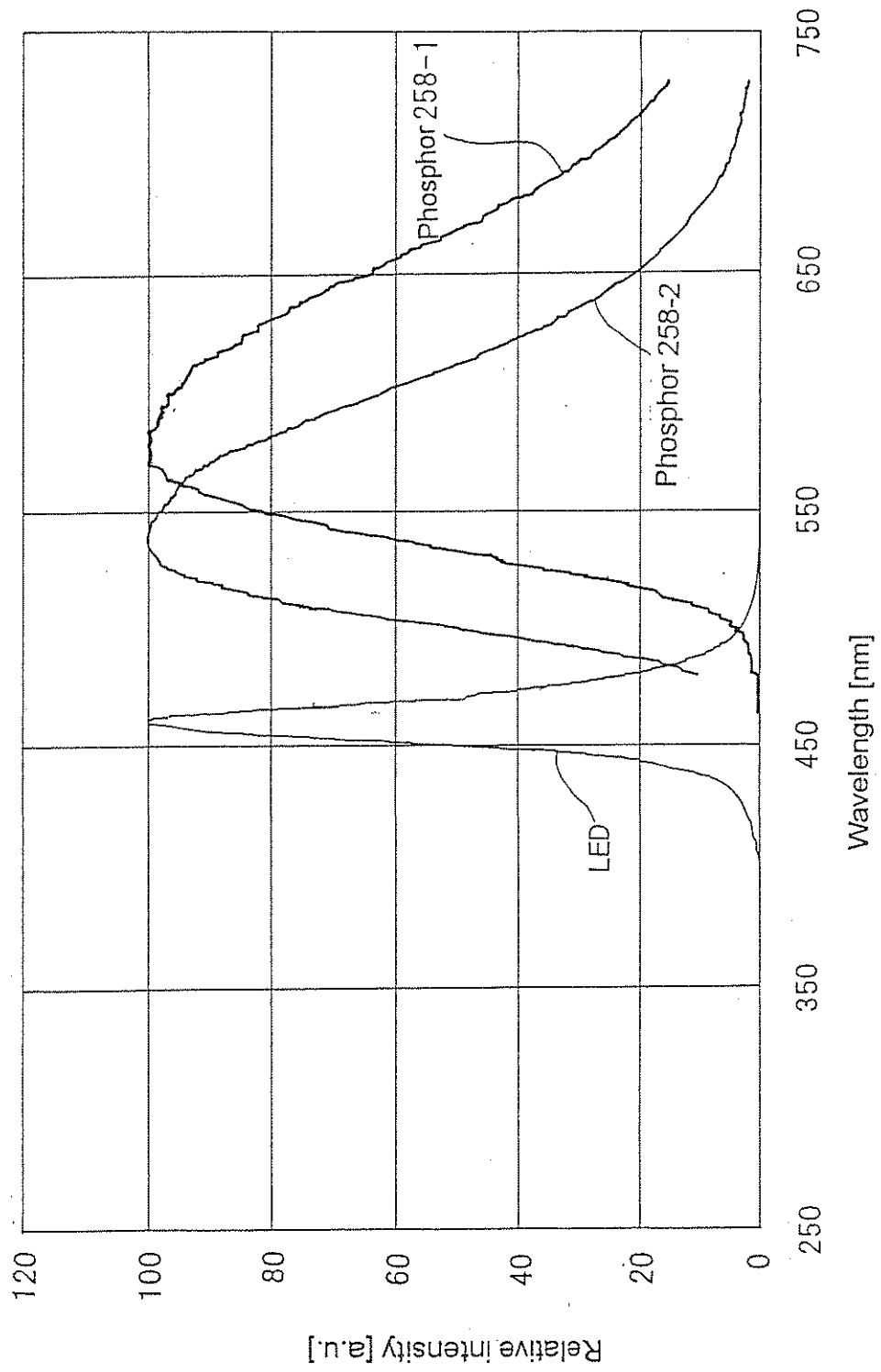


Fig. 70



Luminescence spectra of YAG-base phosphors

Fig. 71

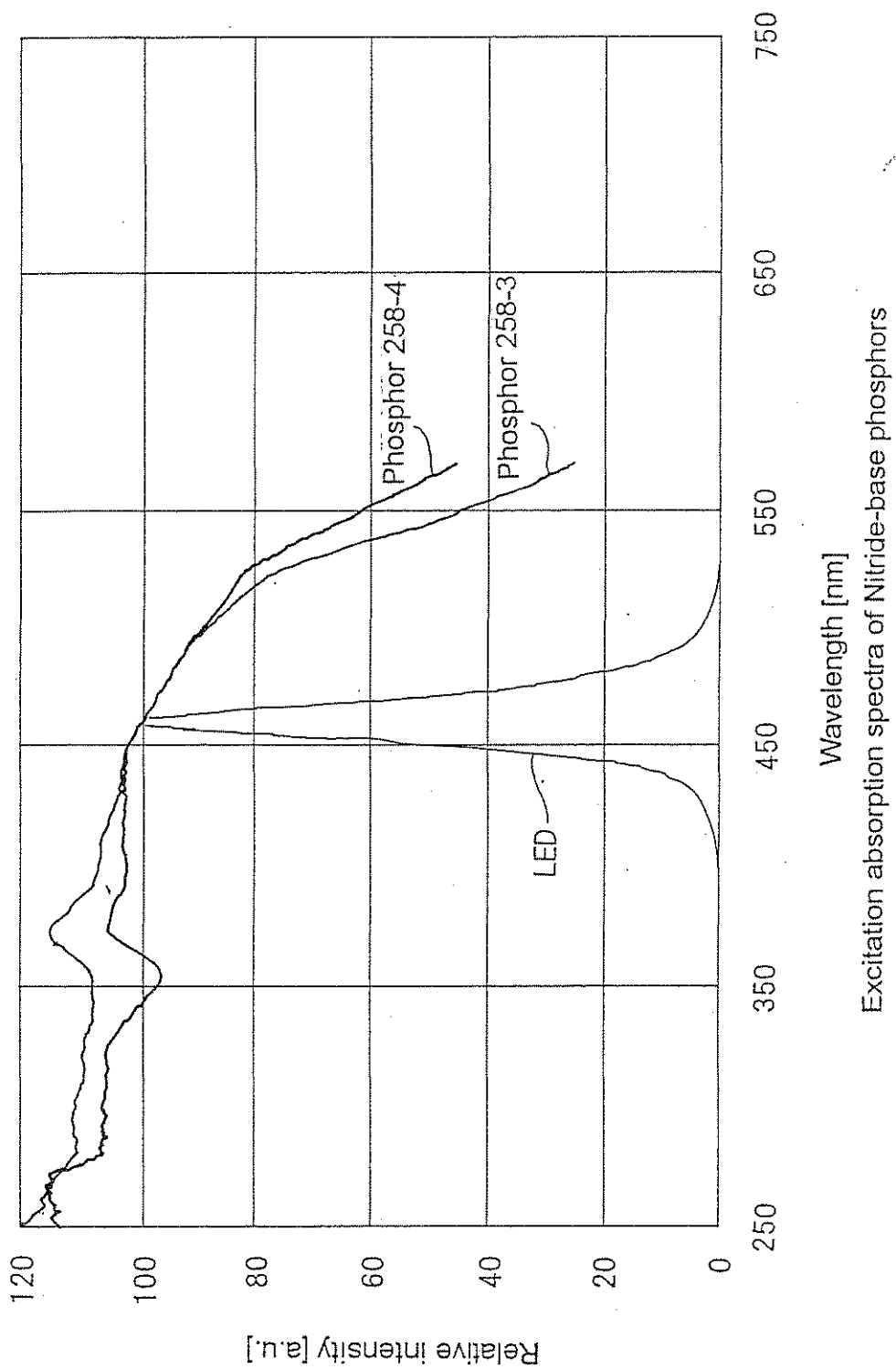


Fig. 72

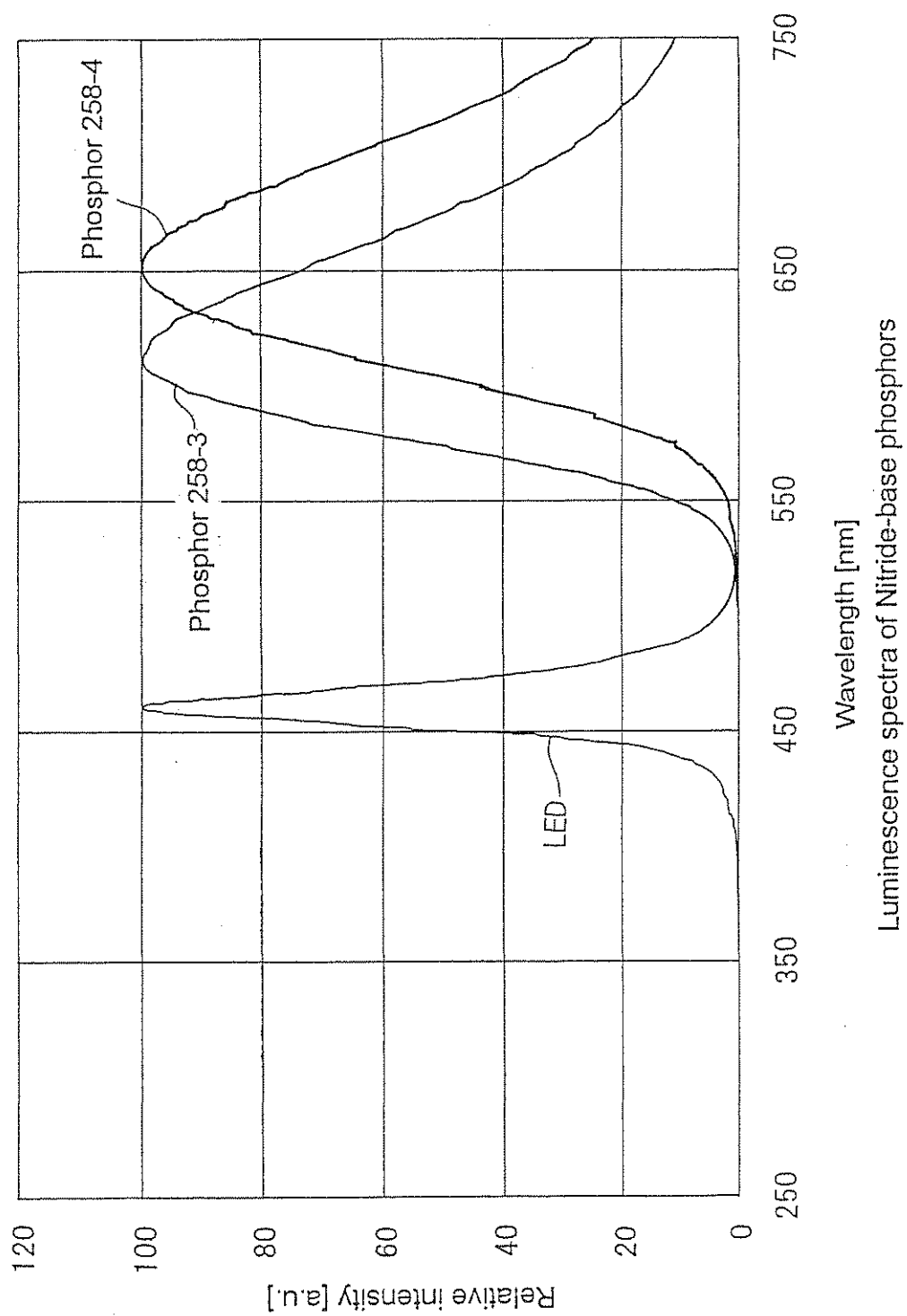


Fig. 73

Electric current - Chromaticity property
($T_a = RT$, $I_f = DC$ drive)

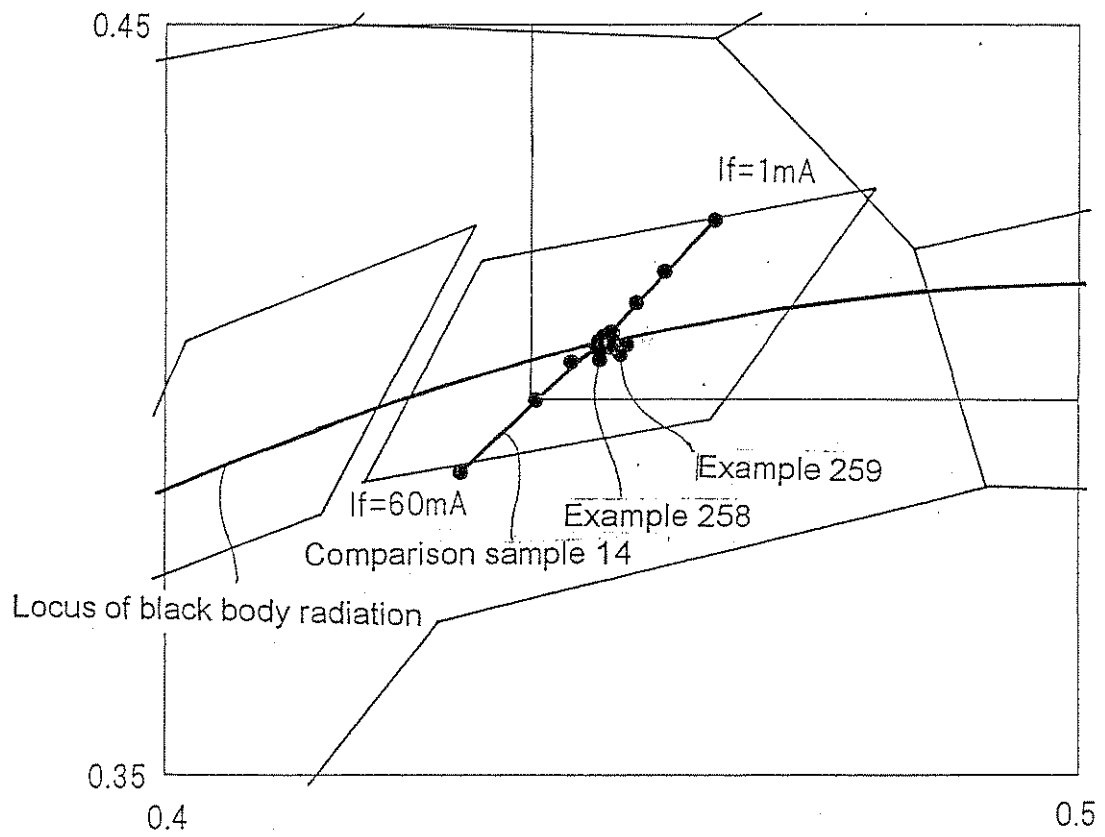


Fig. 74

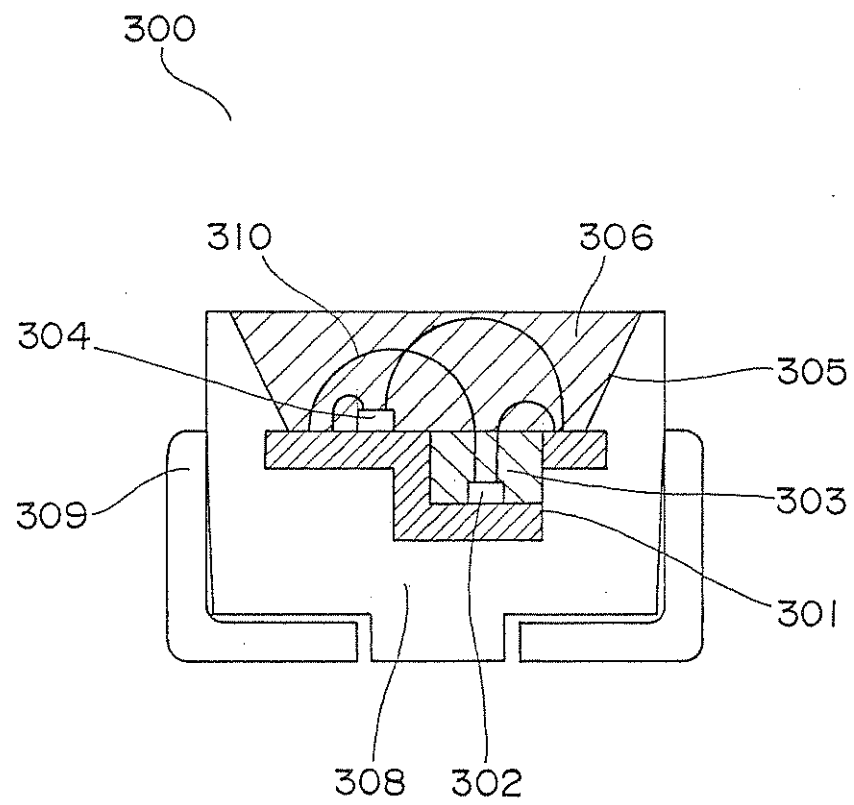


Fig. 75

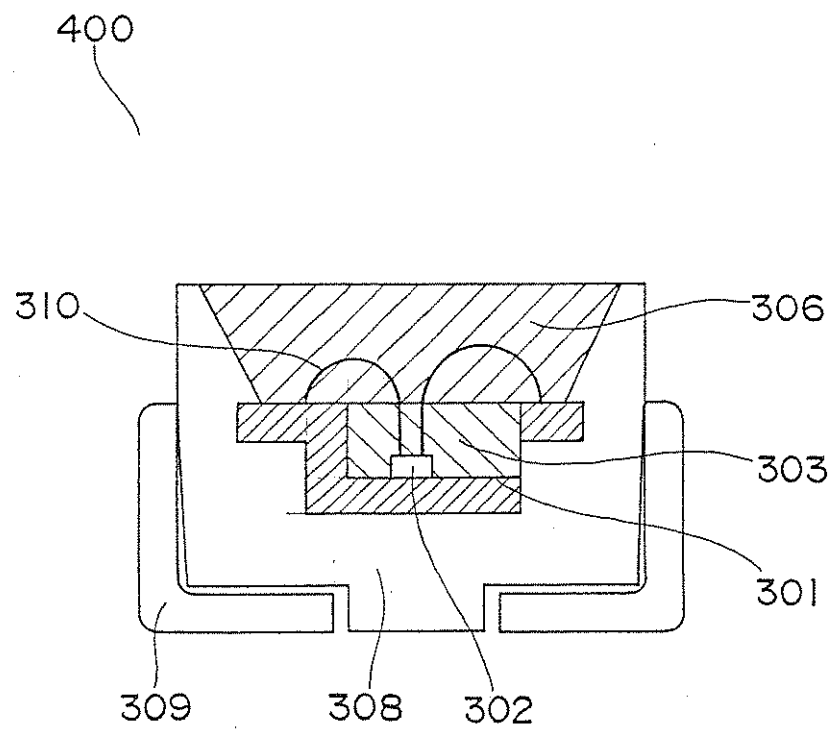


Fig. 76

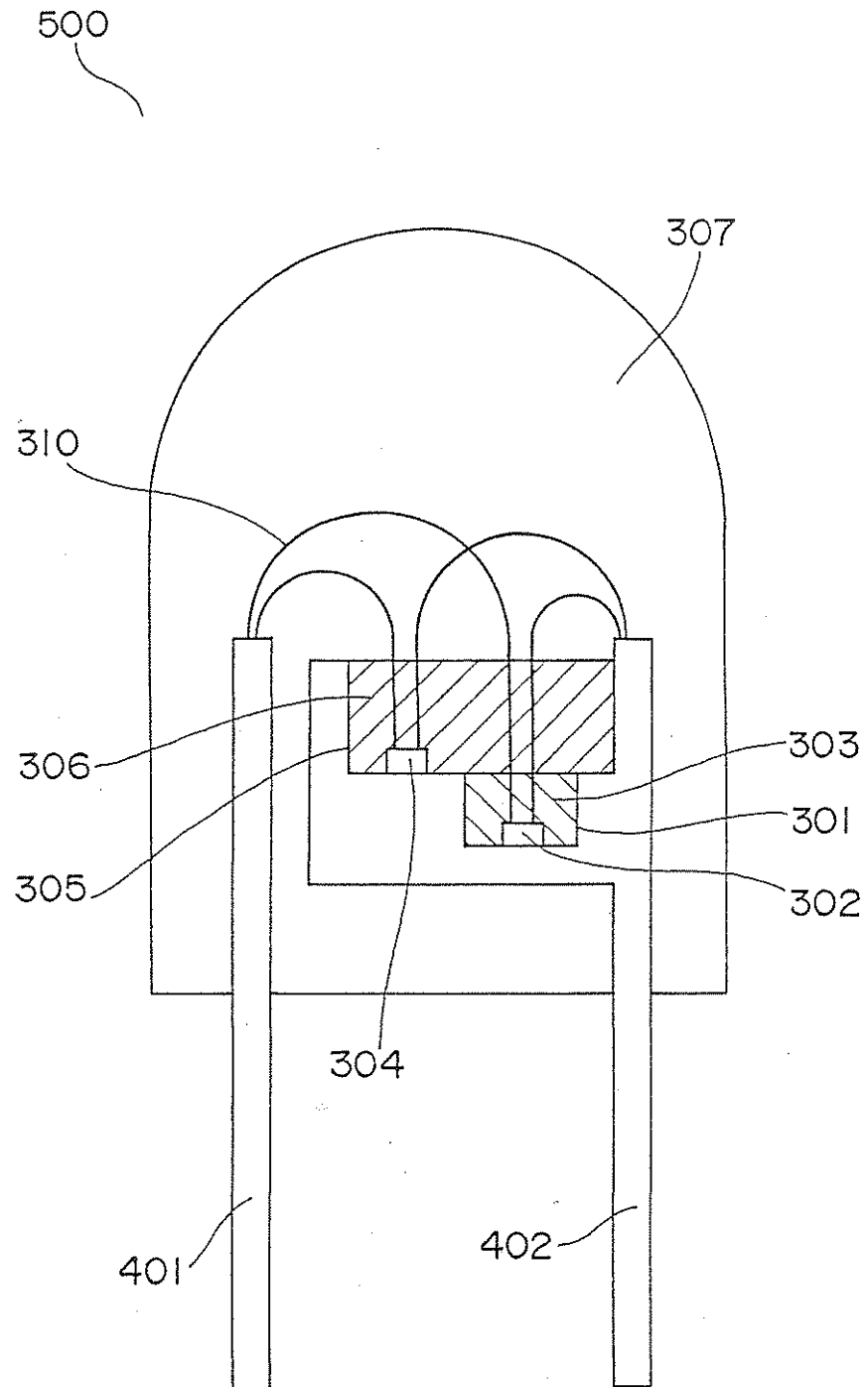


Fig. 77

600

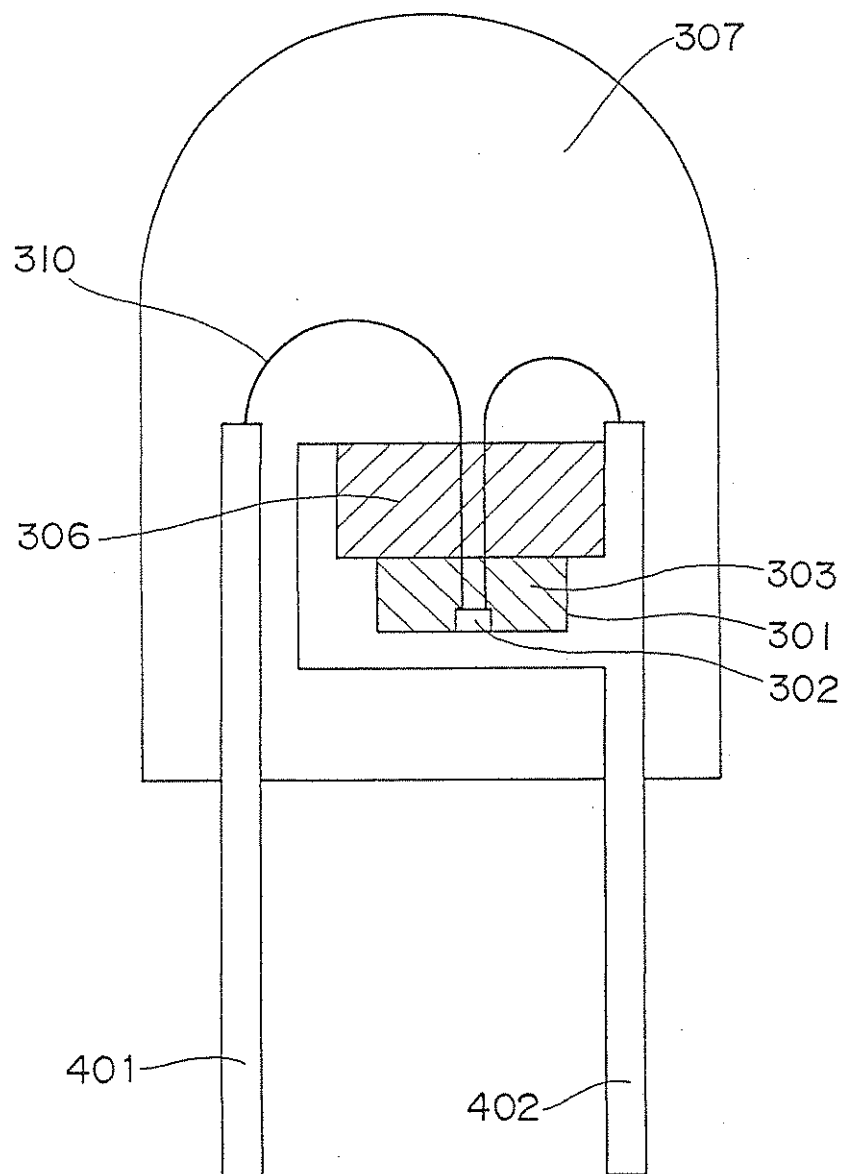


Fig. 78A

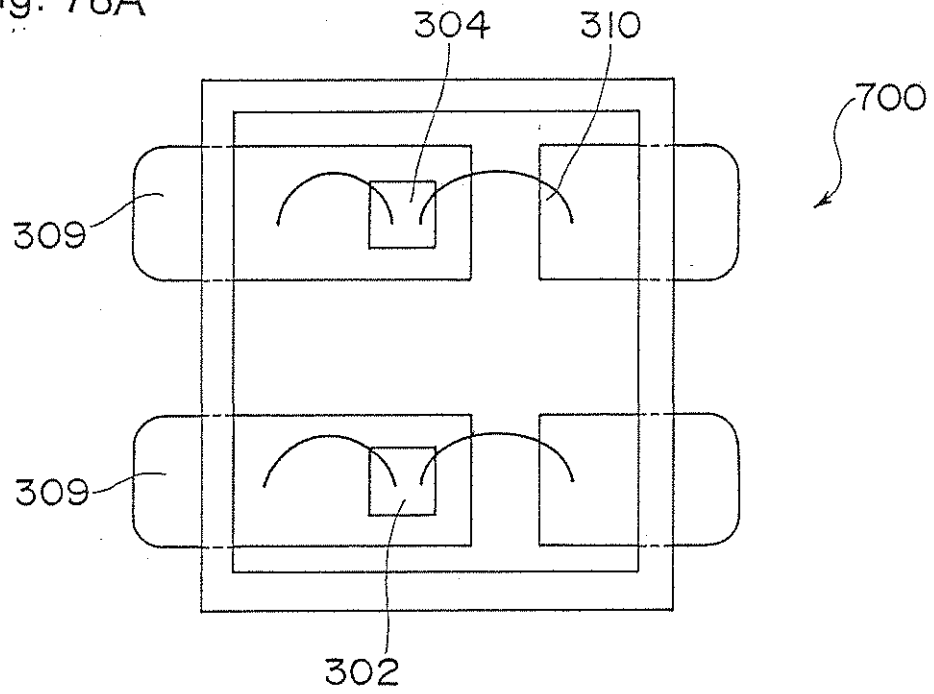


Fig. 78B

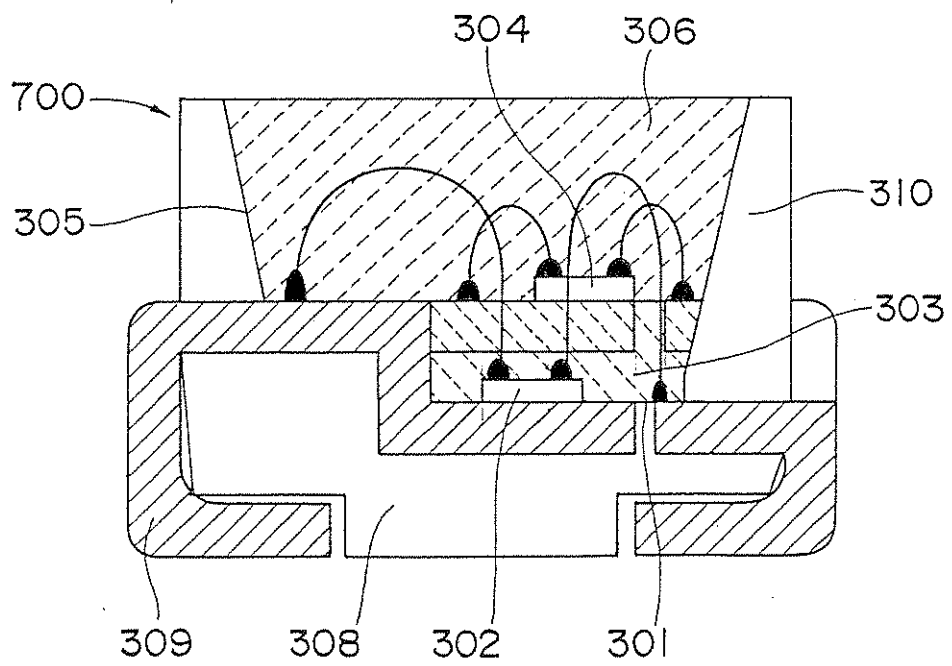
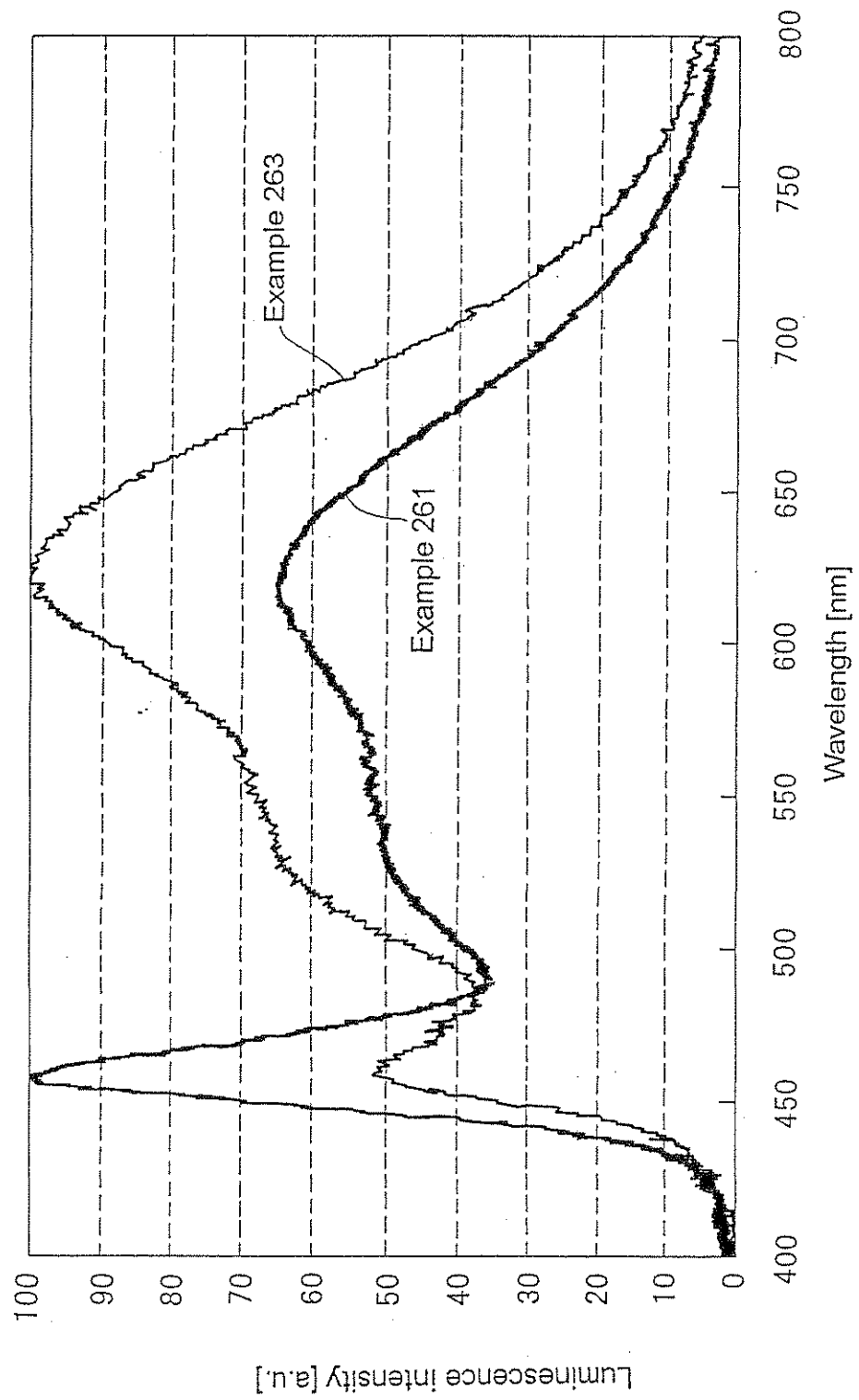


Fig. 79

Luminescence spectra of Examples 261, 263



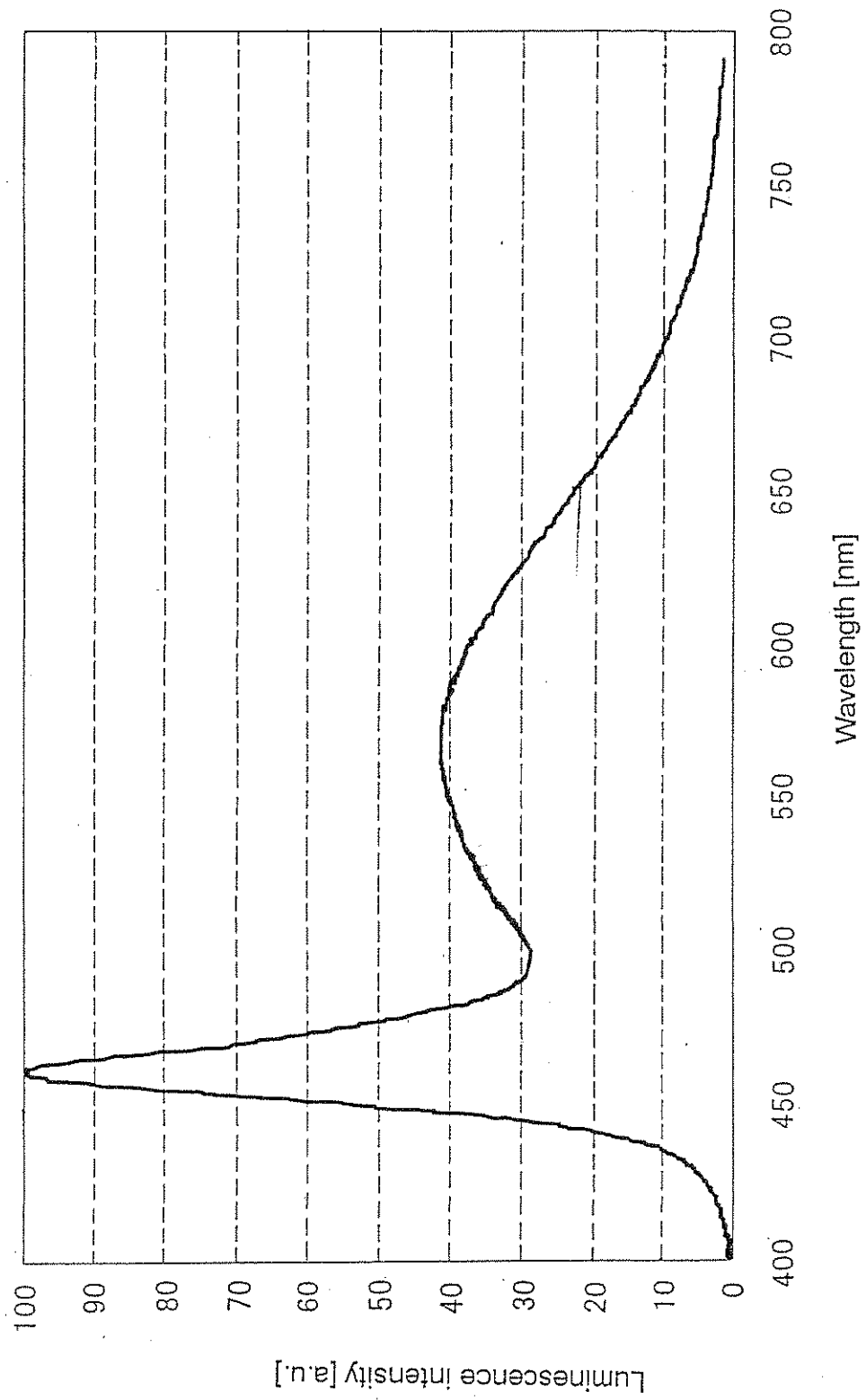
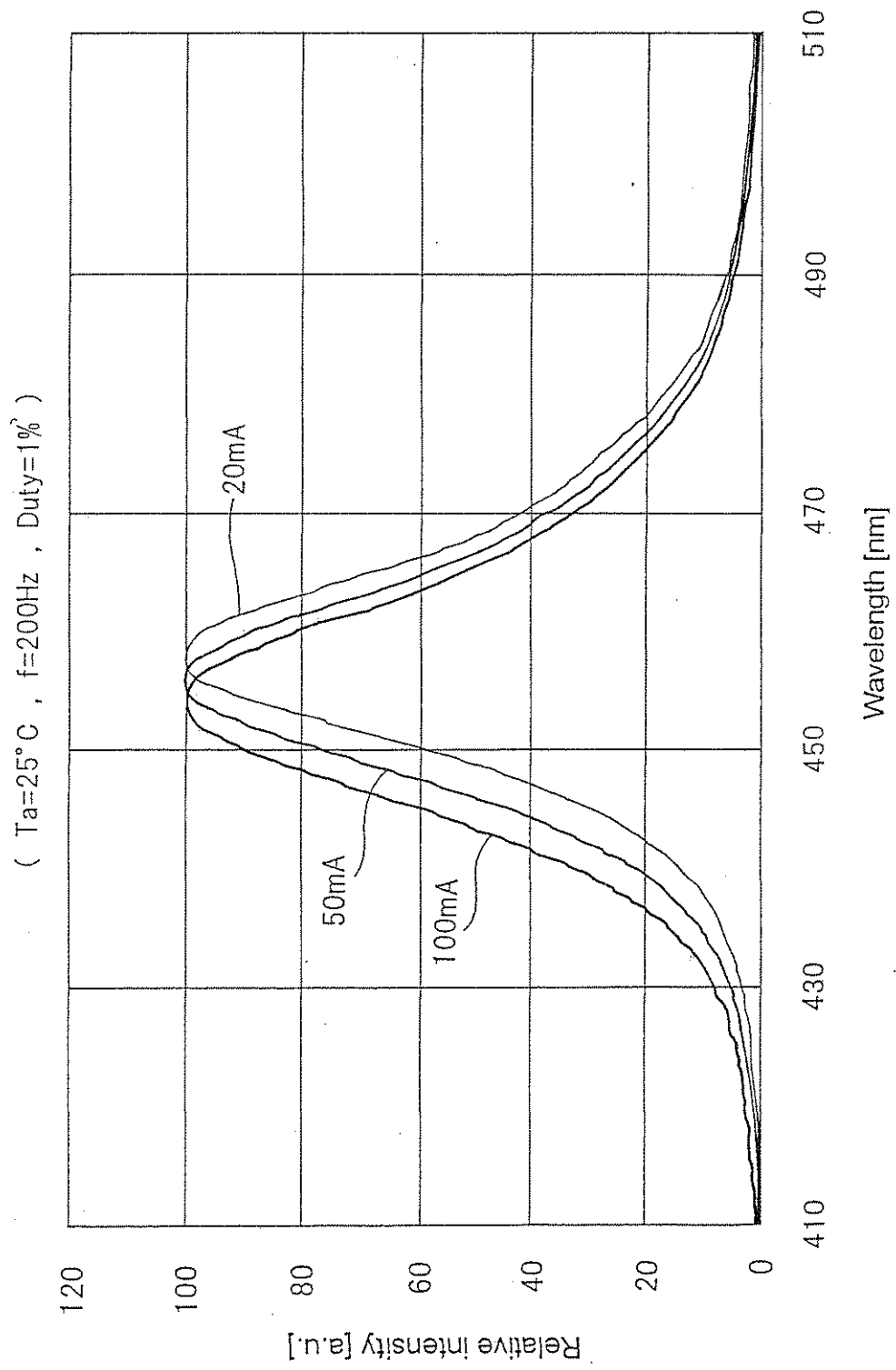


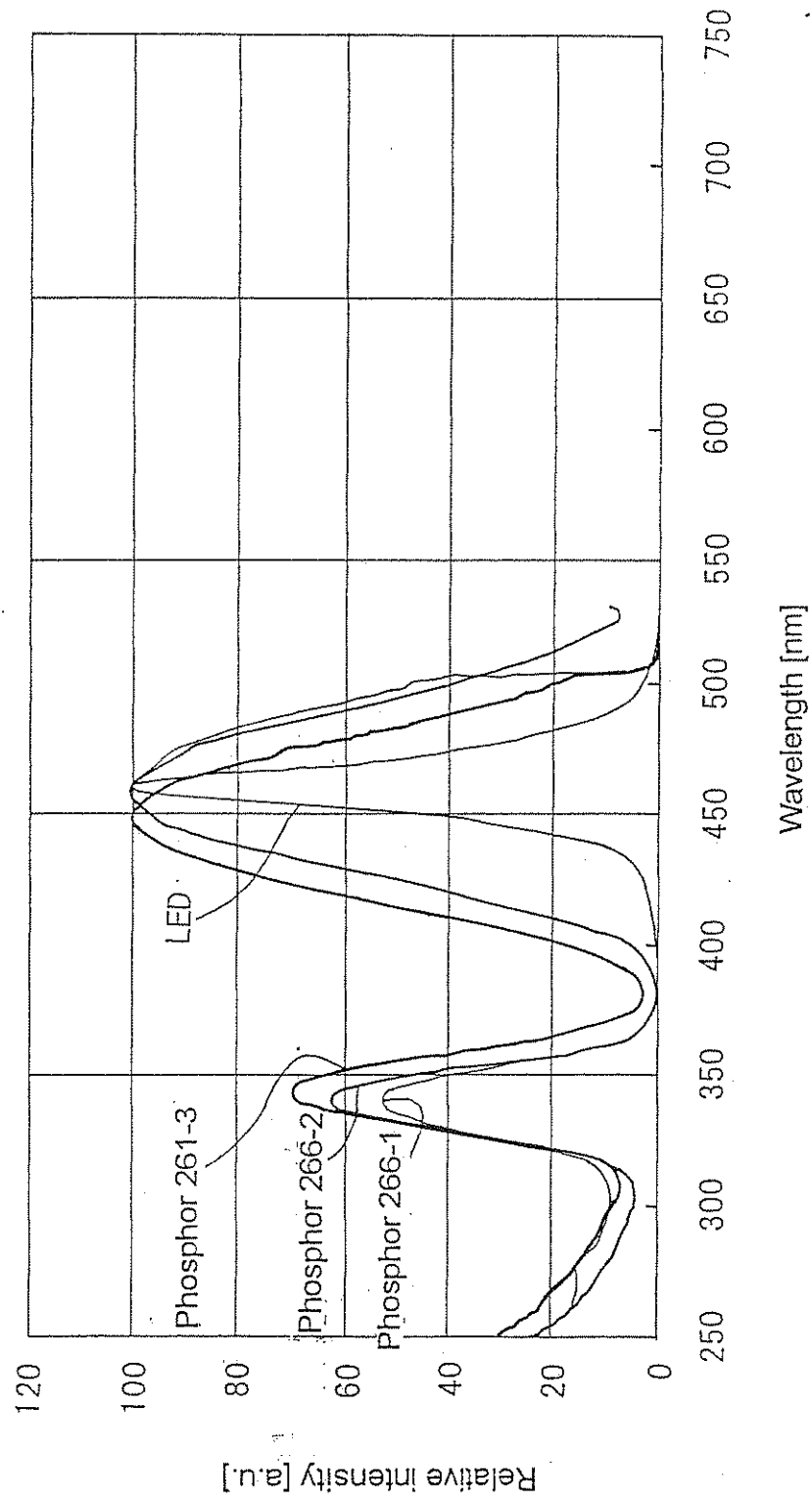
Fig. 80

Fig. 81



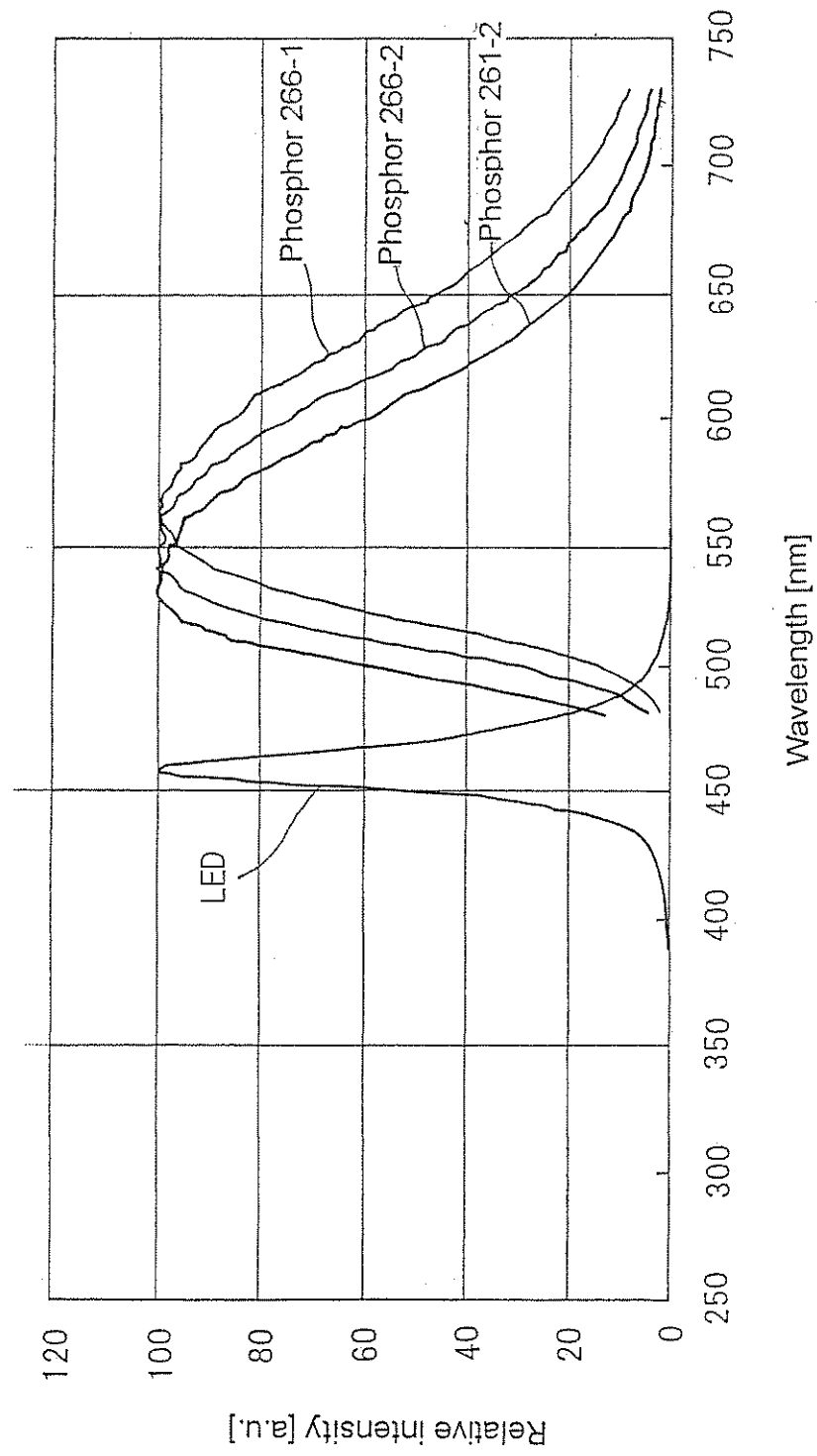
Electric current - relative luminescence spectra of LED of 460nm for exciting a phosphor

Fig. 82



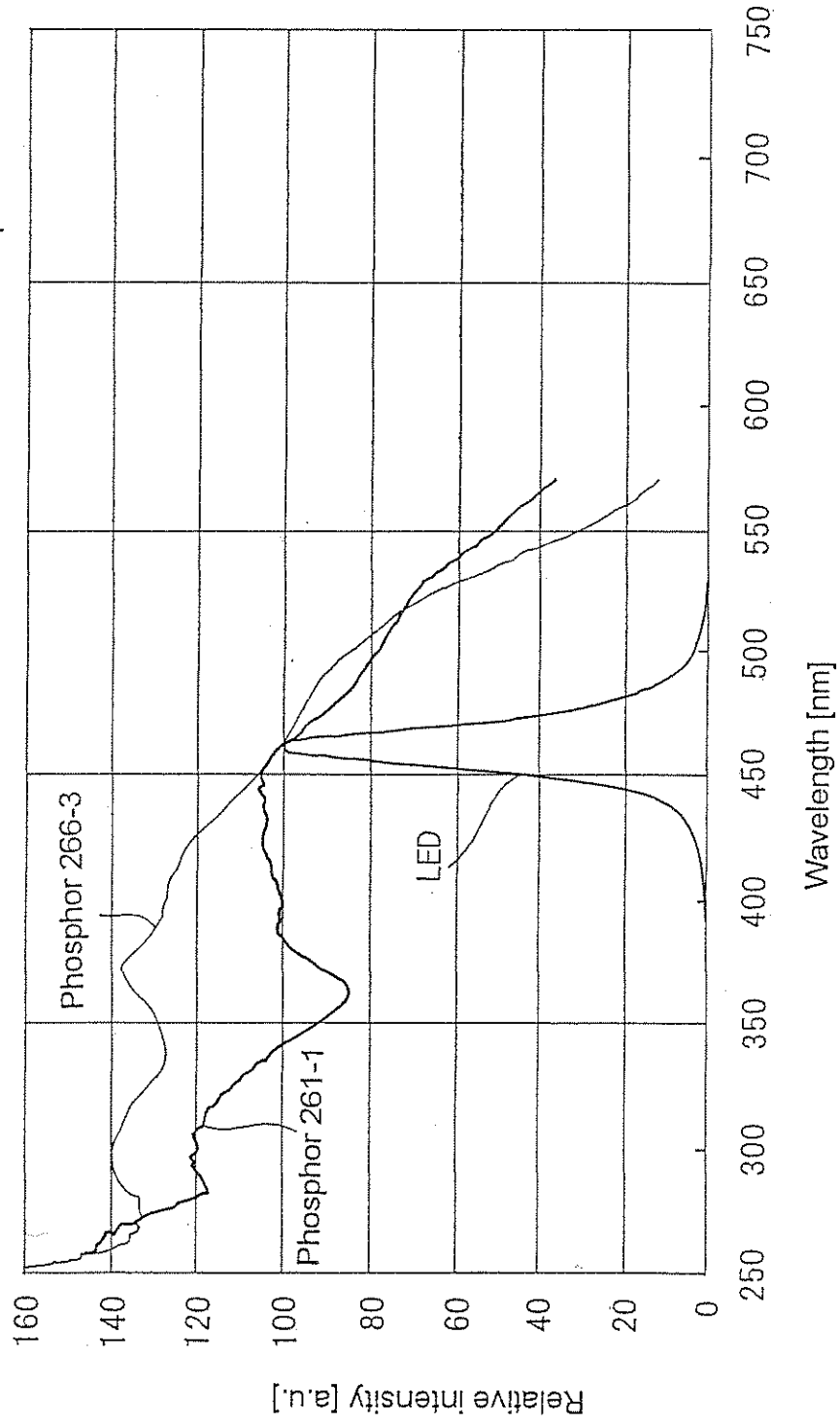
Excitation absorption spectra of YAG-base phosphors

Fig. 83



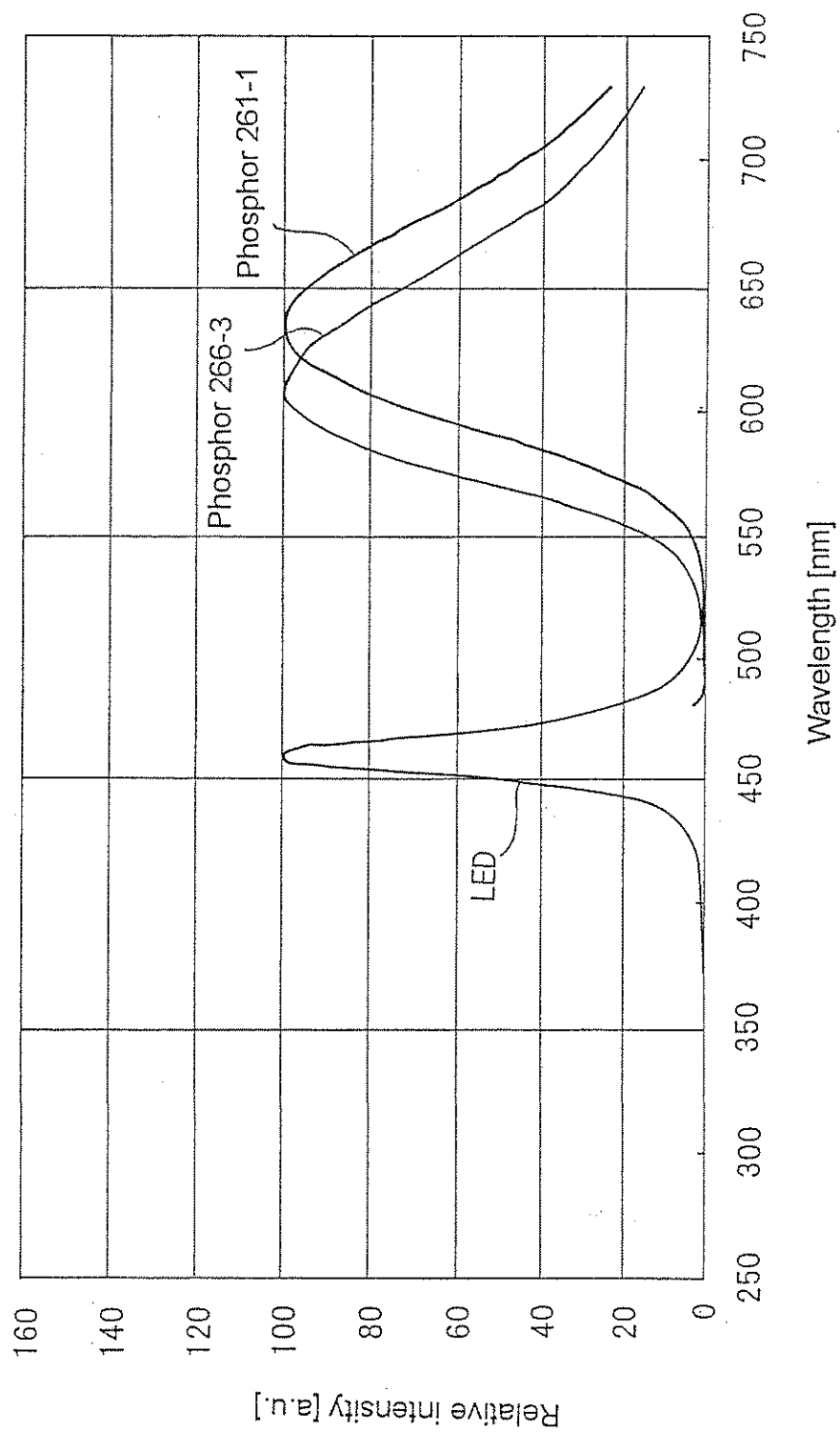
Luminescence spectra of YAG-base phosphors

Fig. 84



Excitation absorption spectrum of Nitride-base phosphors

Fig. 85



Luminescence spectra of Nitride-base phosphors

Fig. 86

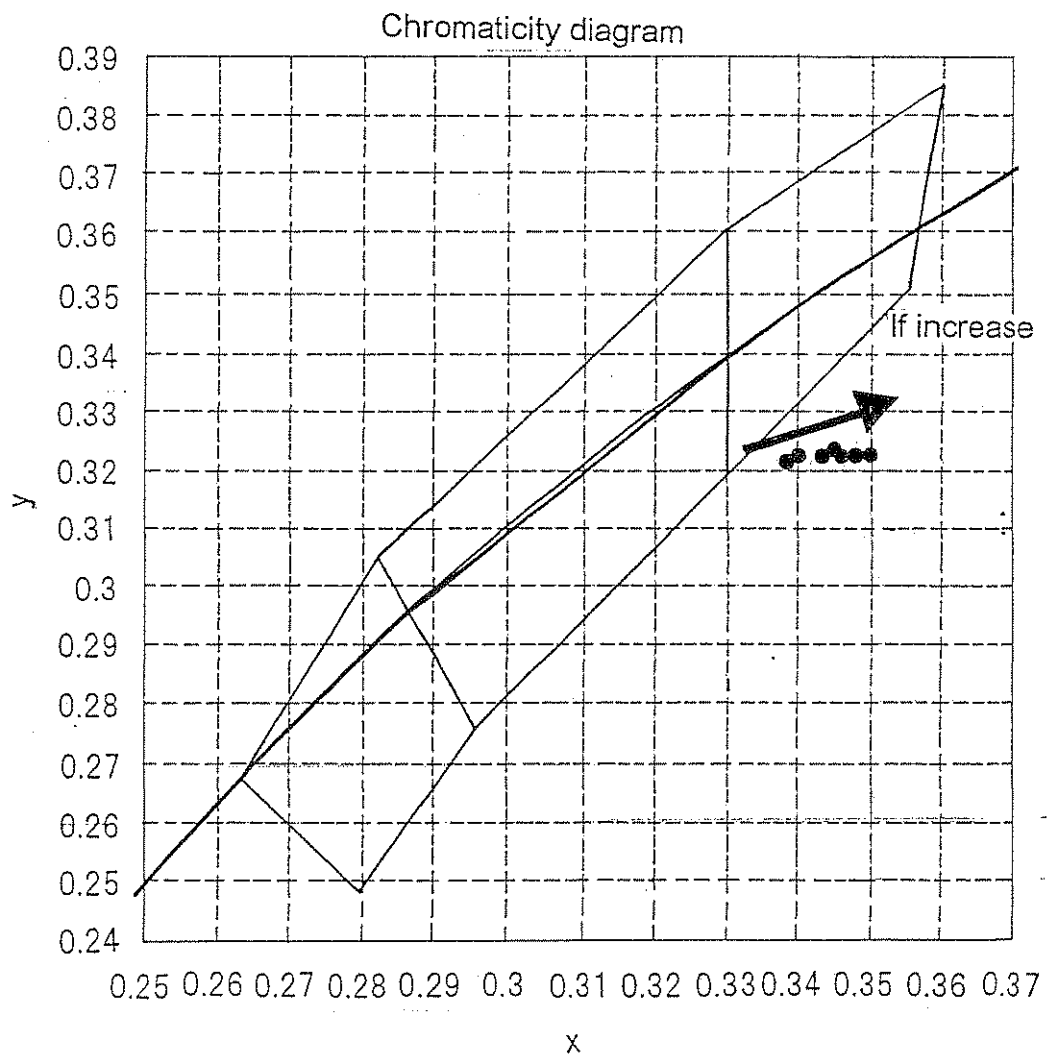


Fig. 87

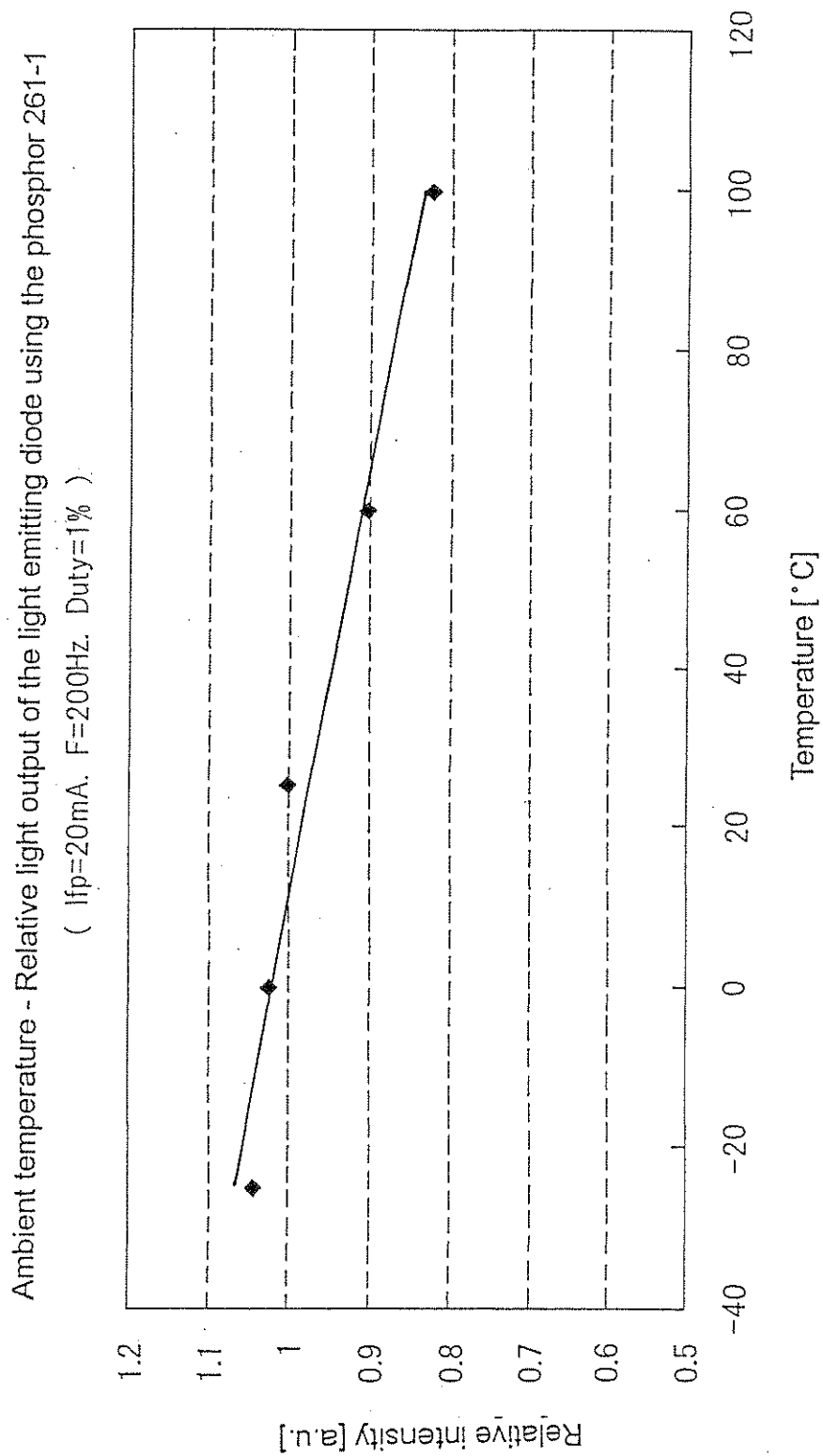


Fig. 88

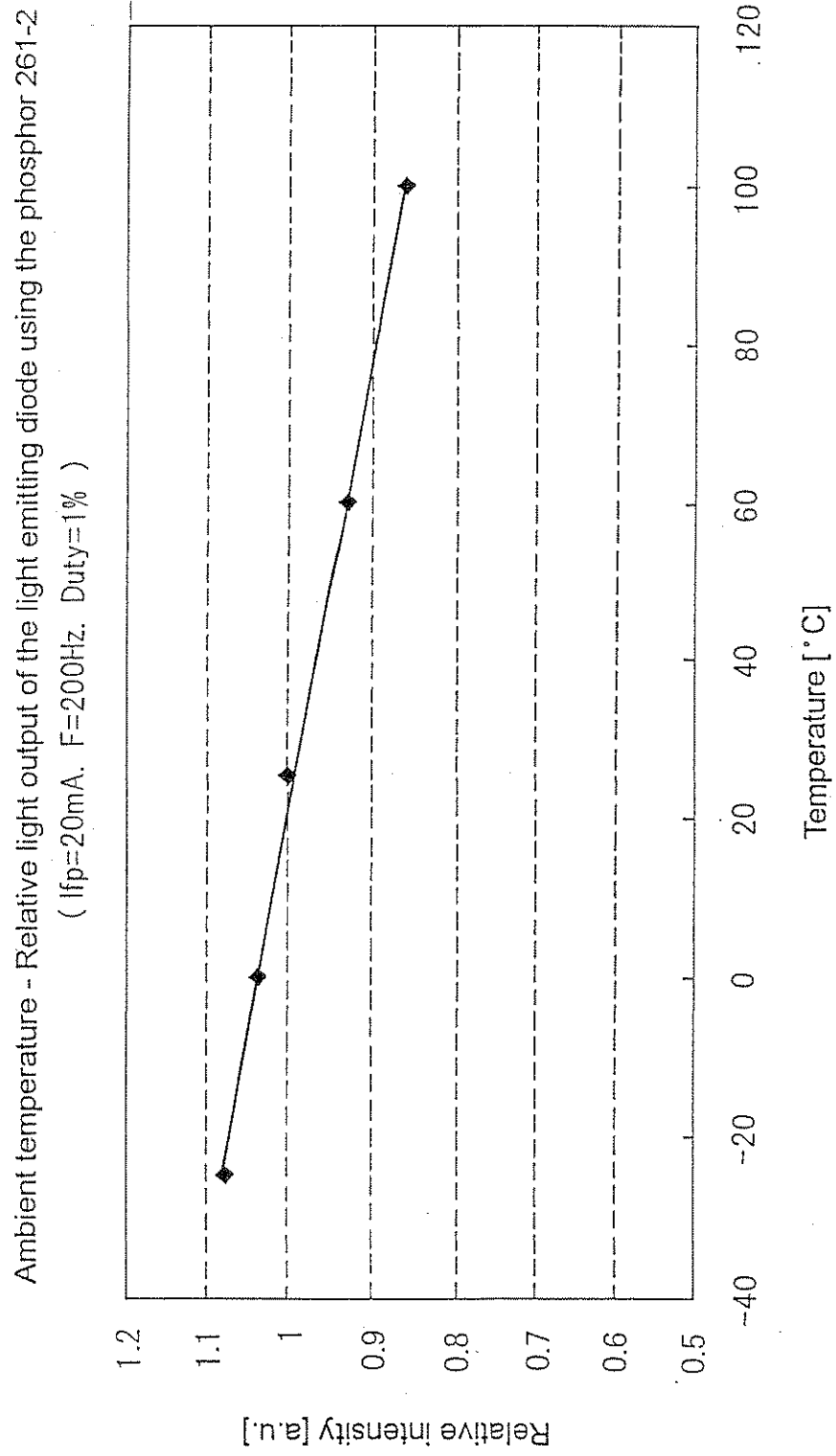


Fig. 89

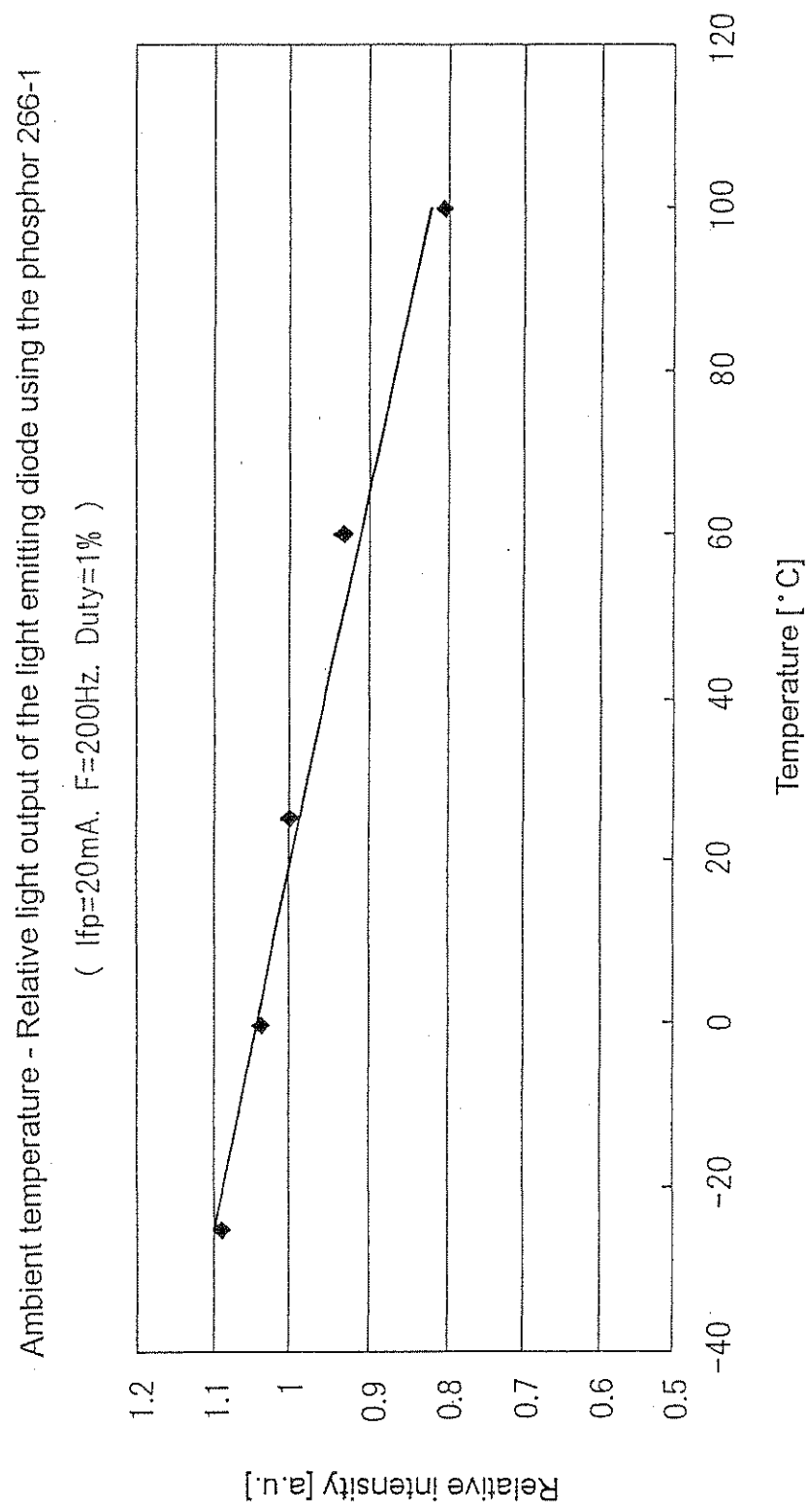


Fig. 90

Ambient temperature - Relative light output of the light emitting diode using the phosphor 266-2
($I_{fp}=20\text{mA}$, $F=200\text{Hz}$, Duty=1%)

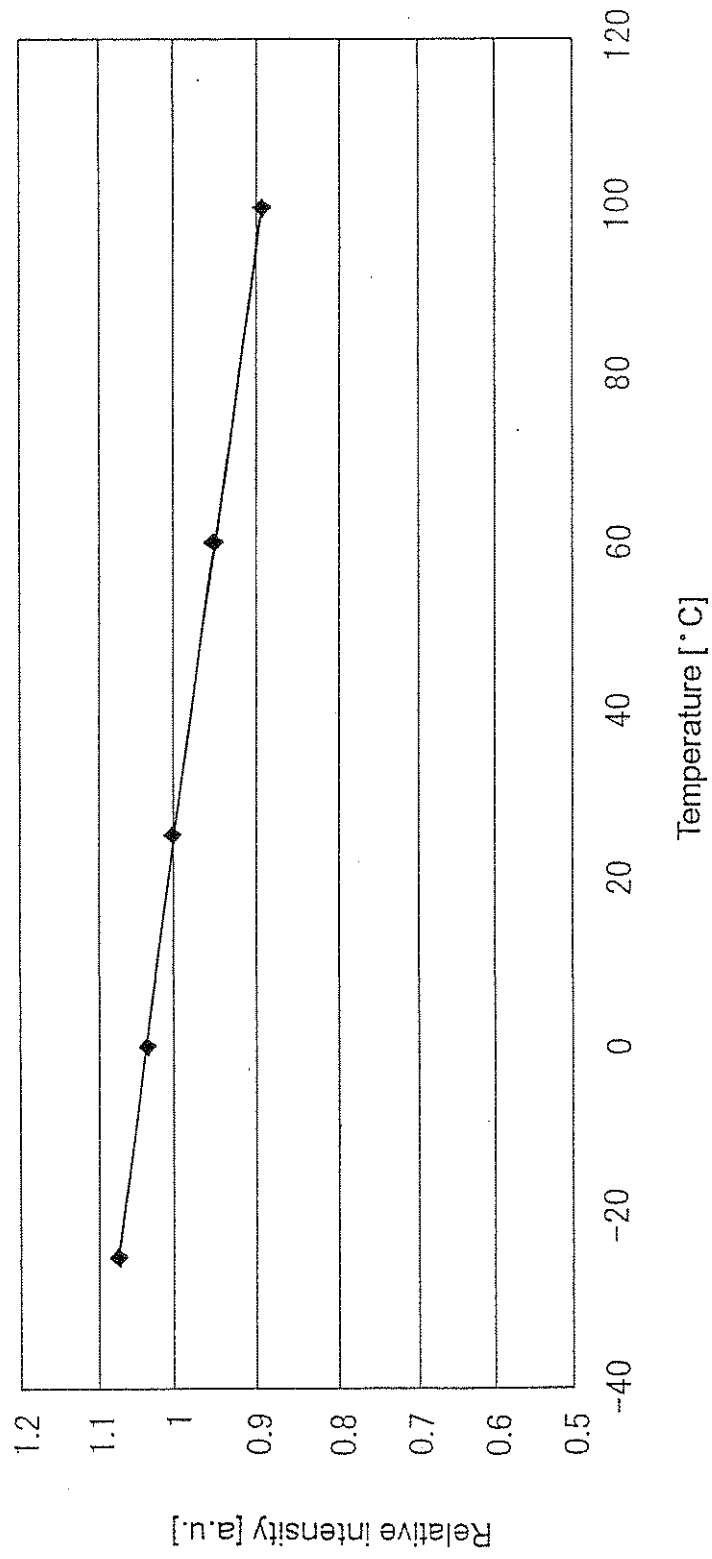


Fig. 91

Ambient temperature - Relative light output of the light emitting diode using the phosphor 266-3
($I_{fp}=20\text{mA}$, $F=200\text{Hz}$, Duty=1%)

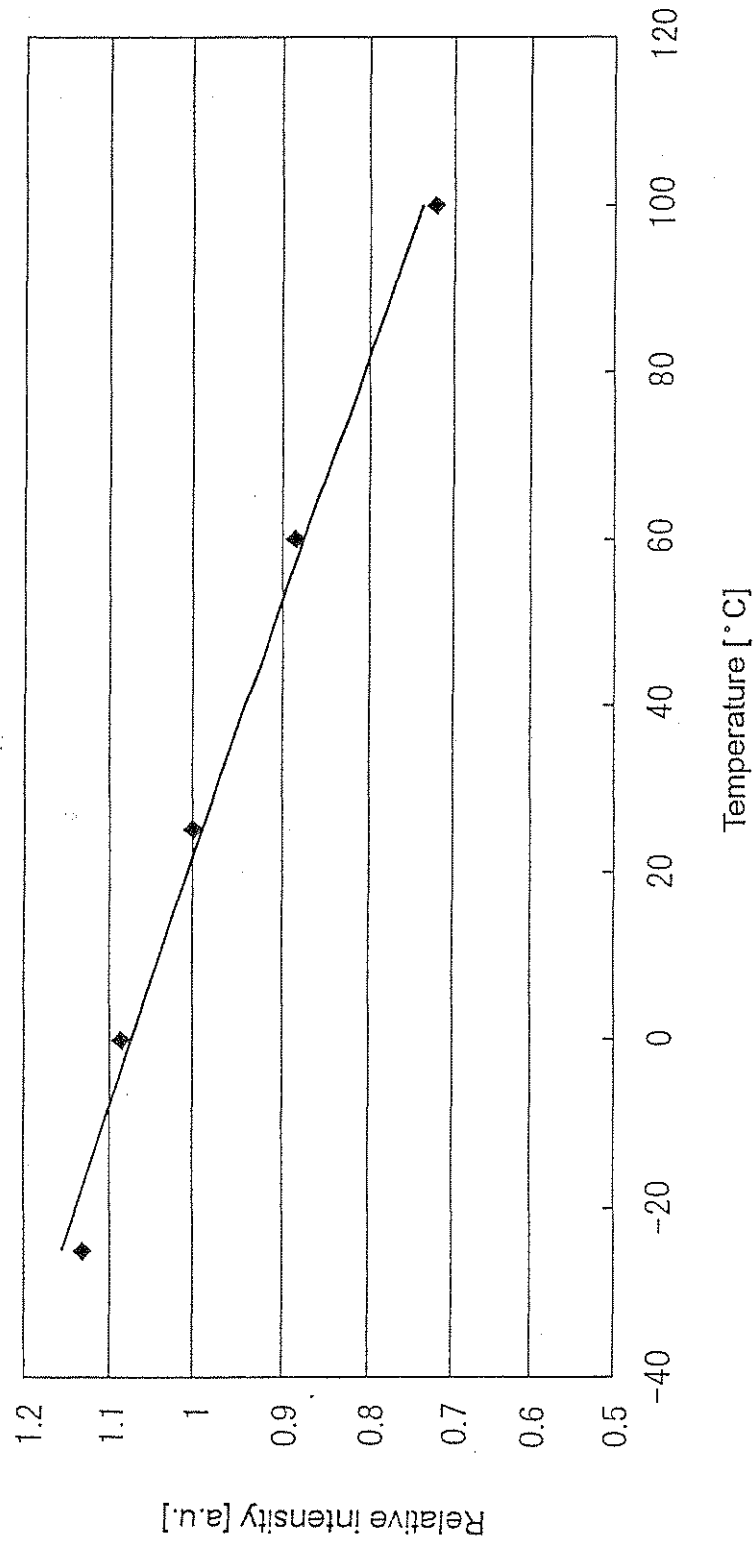
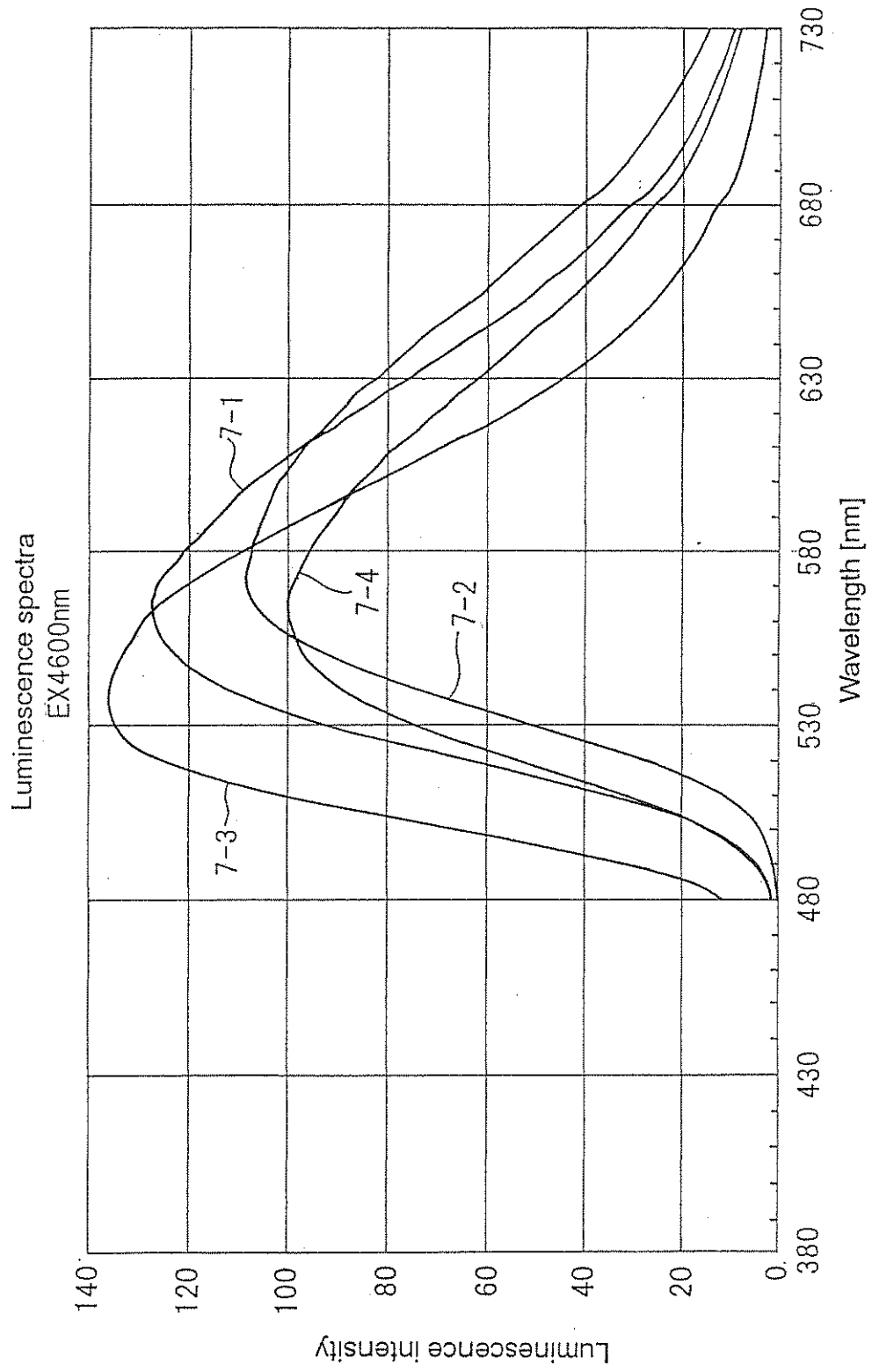


Fig. 92



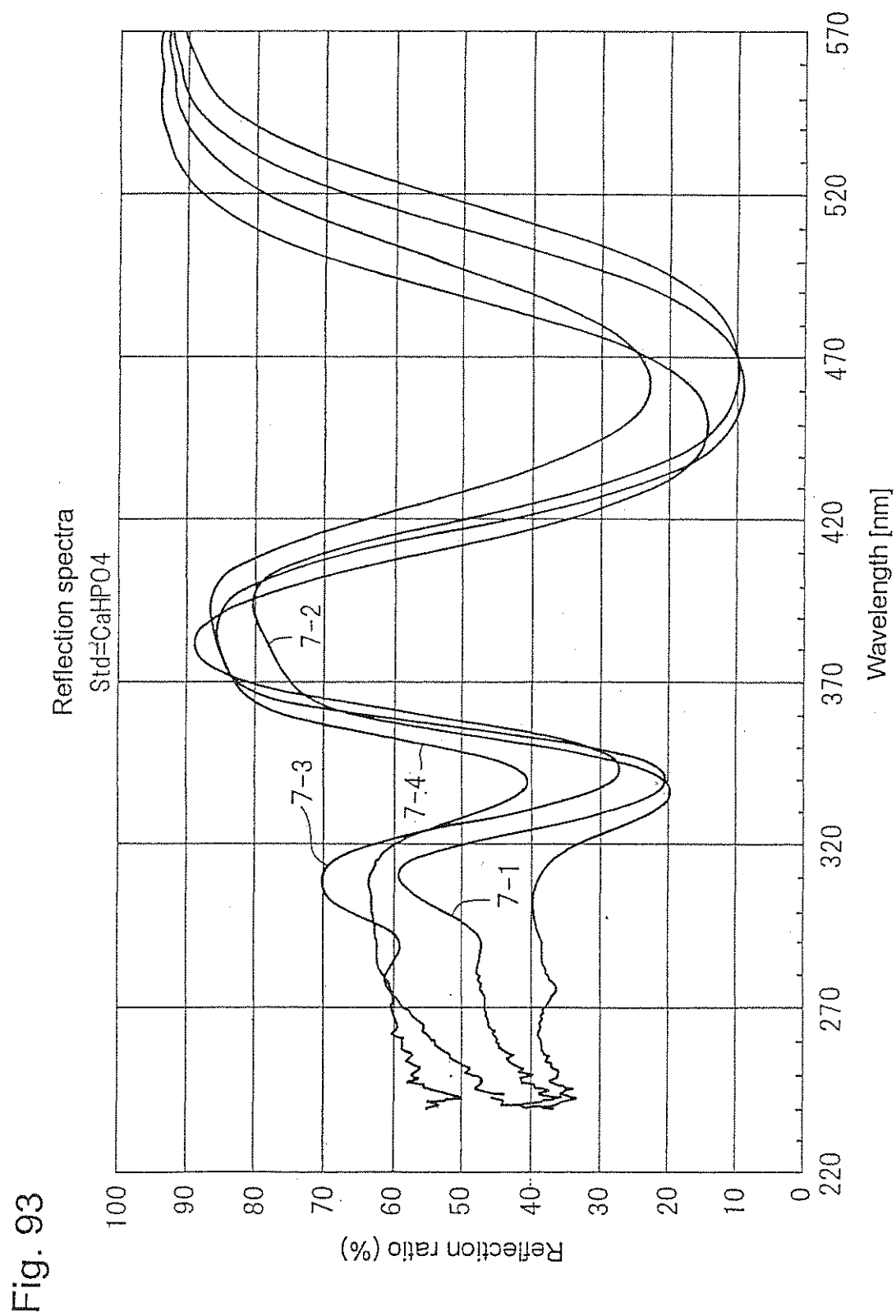


Fig. 94

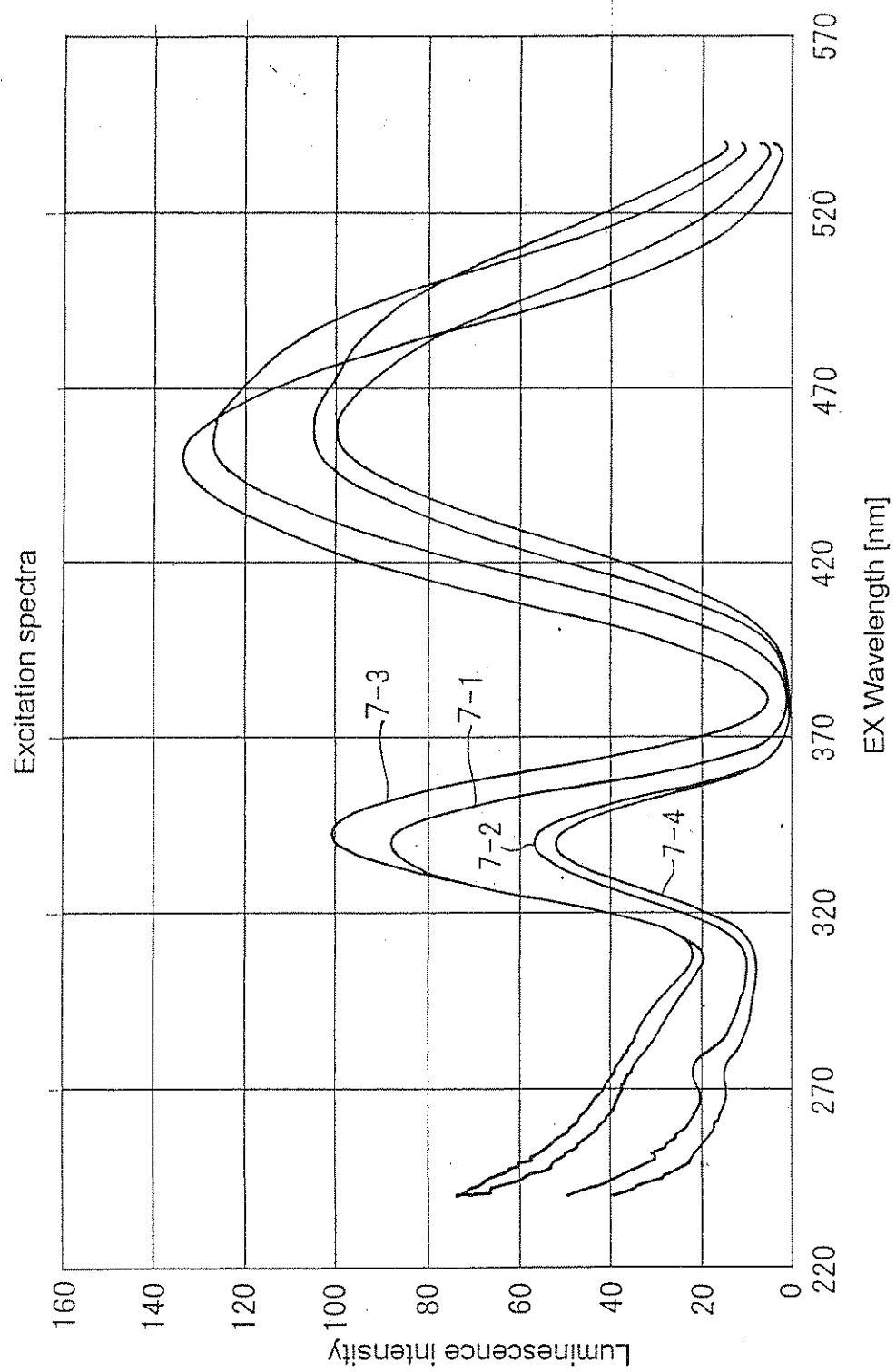


Fig. 95

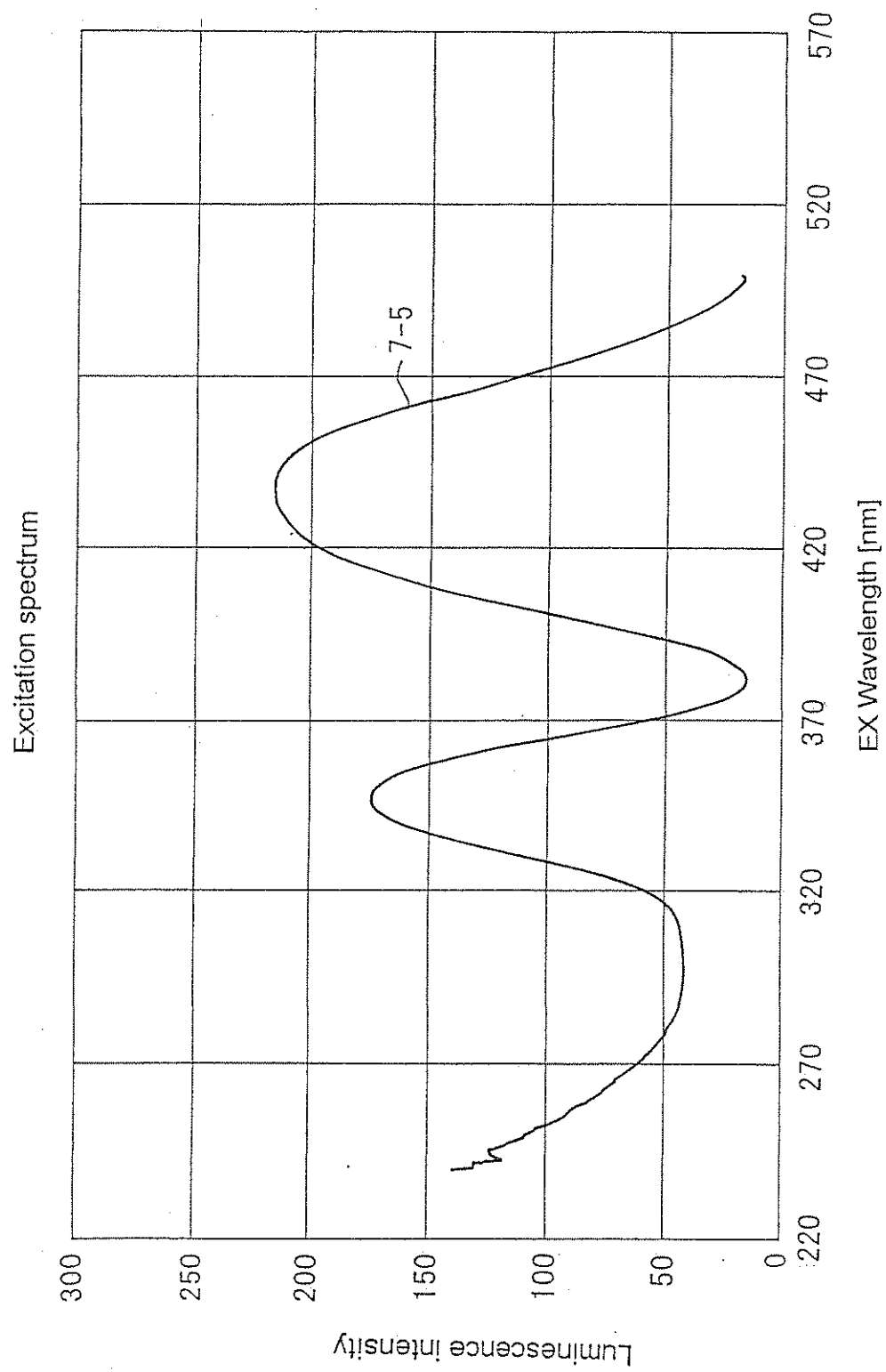


Fig. 96

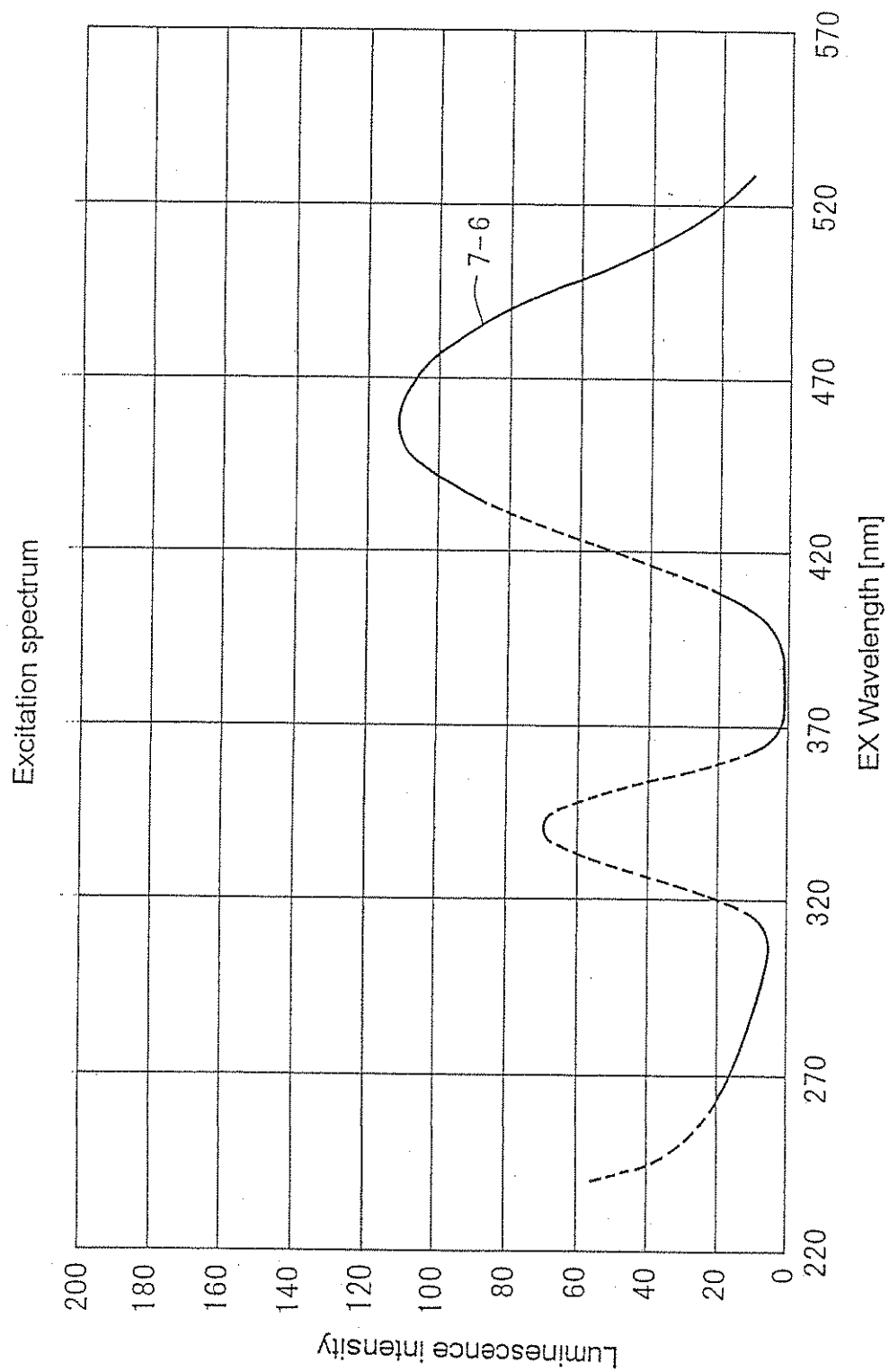


Fig. 97

