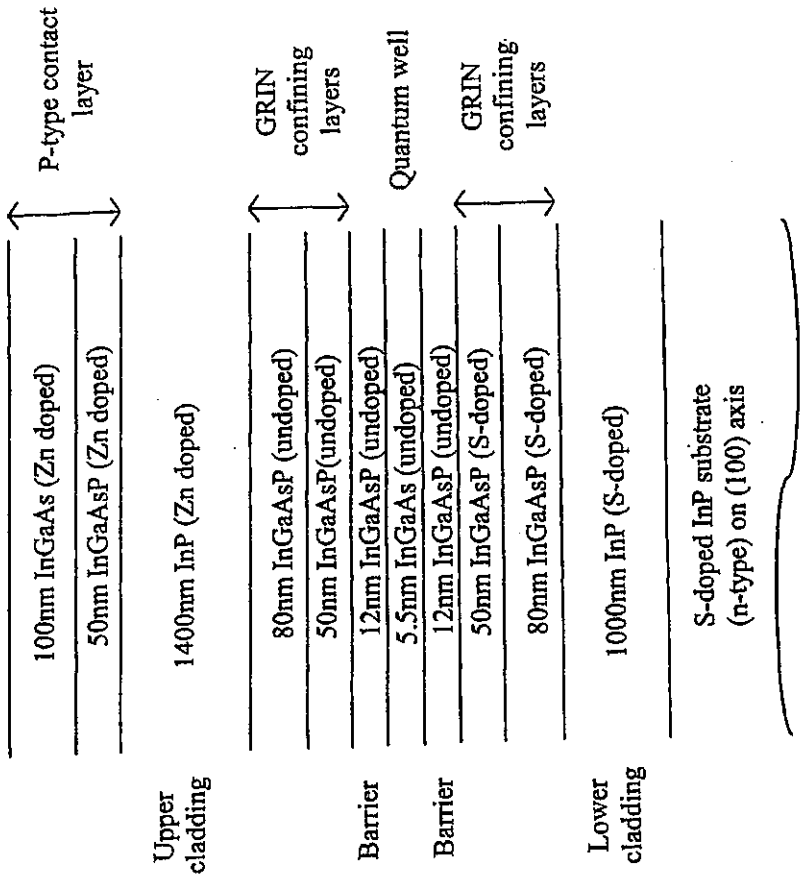

100nm InGaAs (Zn doped)
50nm InGaAsP (Zn doped)
P-type contact layer
1400nm InP (Zn doped)
Upper cladding
80nm InGaAsP (undoped)
50nm InGaAsP(undoped)
GRIN confining layers
12nm InGaAsP (undoped)
5.5nm InGaAs (undoped)
12nm InGaAsP (undoped)
Quantum well
Barrier
Barrier
50nm InGaAsP (S-doped)
80nm InGaAsP (S-doped)
GRIN confining layers
1000nm InP (S-doped)
Lower cladding
S-doped InP substrate
(n-type) on (100) axis

Figure 1

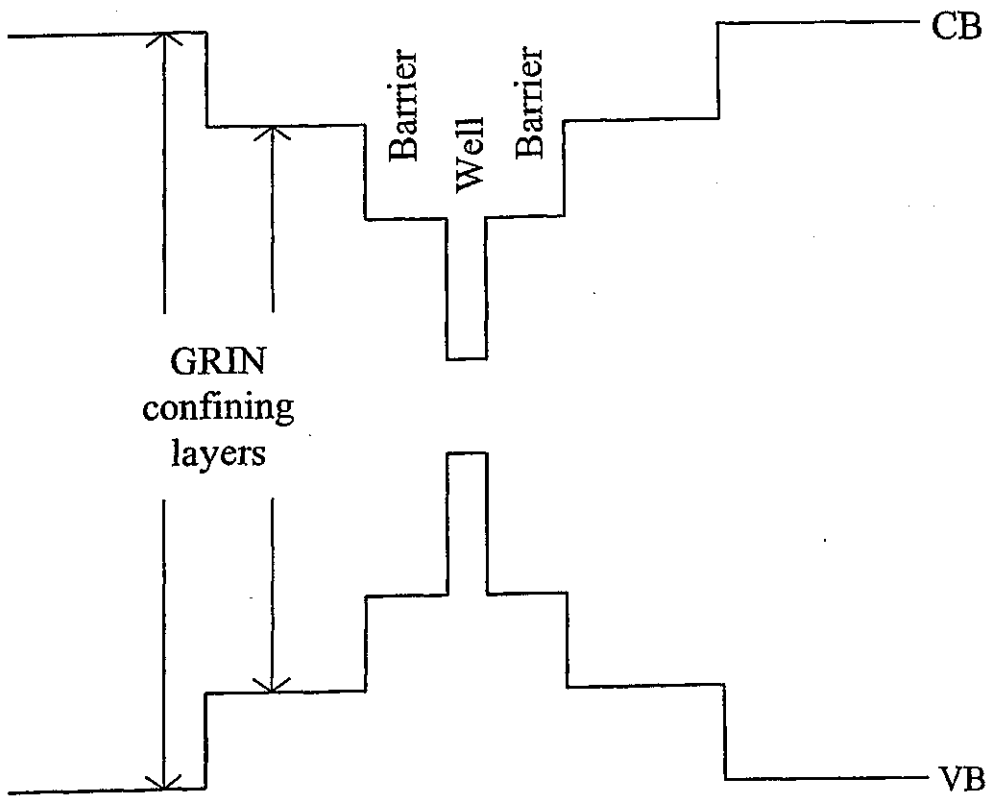


Figure 2

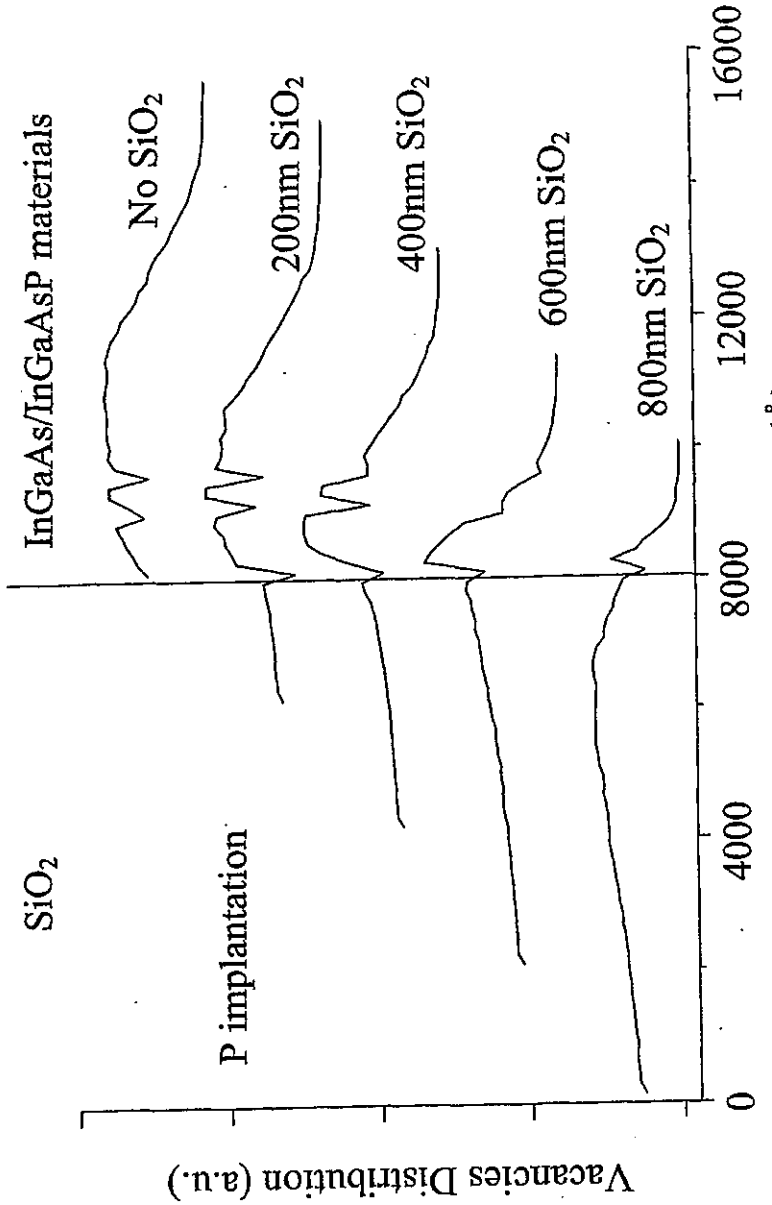

InGaAs/InGaAsP materials
No SiO_2
200nm SiO_2
400nm SiO_2
600nm SiO_2
800nm SiO_2
SiO_2
P implantation
Vacancies Distribution (a.u.)
0
4000
8000
12000
16000
Depth from surface (Å)

Figure 3

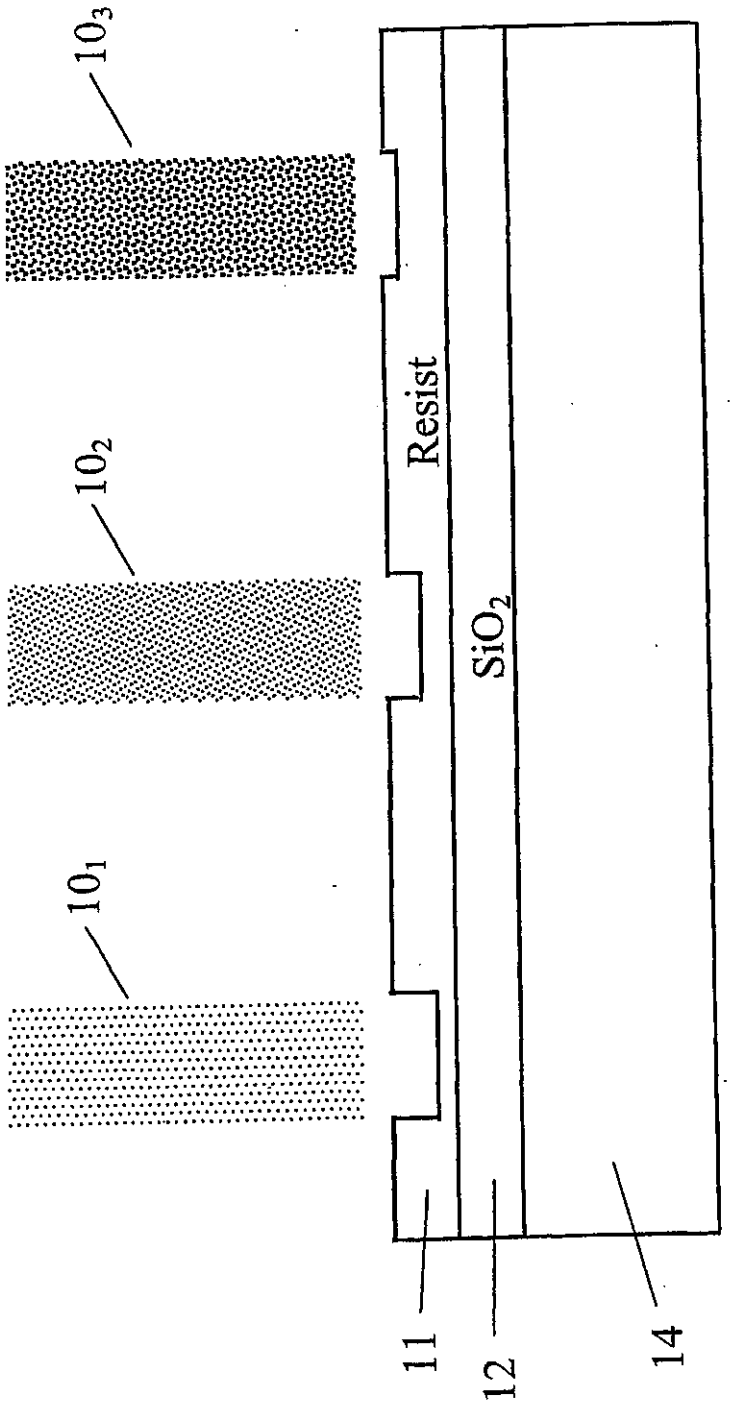


Figure 4

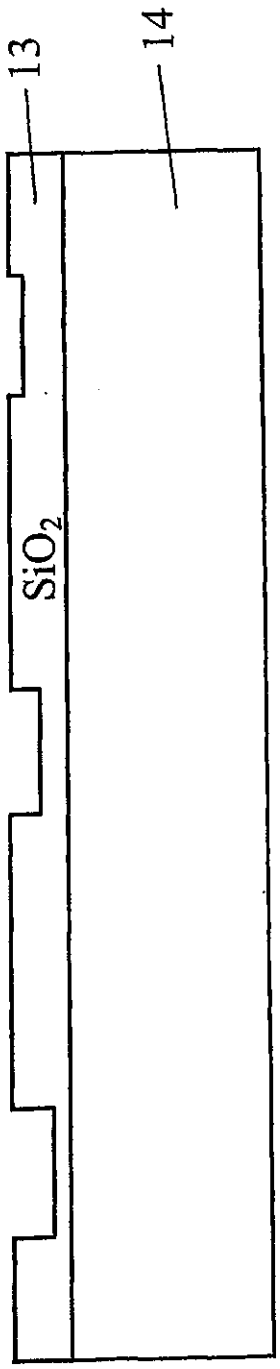


Figure 5

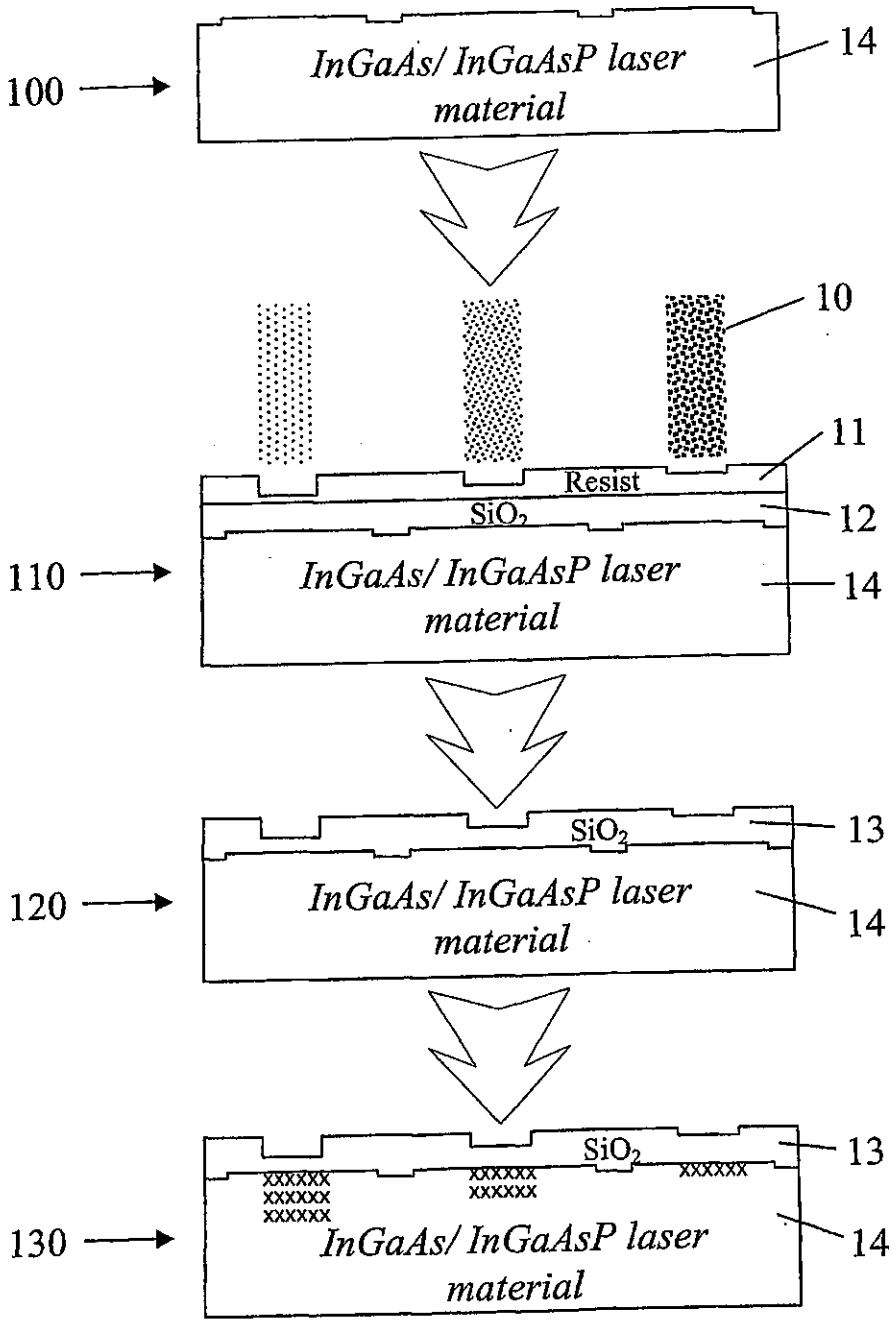

100
InGaAs/ InGaAsP laser material
14
10
11
Resist
SiO2
12
110
InGaAs/ InGaAsP laser material
14
SiO2
13
120
InGaAs/ InGaAsP laser material
14
SiO2
13
130
InGaAs/ InGaAsP laser material
14

Figure 6

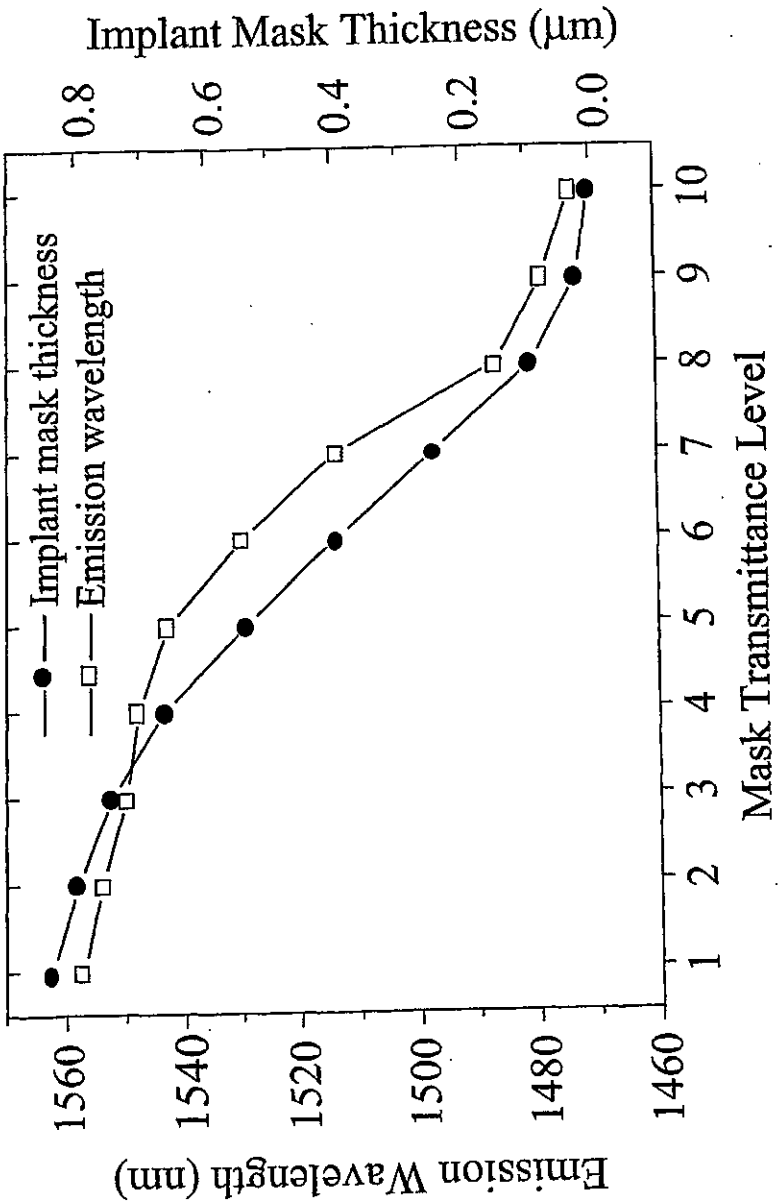

Implant Mask Thickness (μm)
0.8
0.6
0.4
0.2
0.0
Implant mask thickness
Emission wavelength
Mask Transmittance Level
1 2 3 4 5 6 7 8 9 10
Emission Wavelength (nm)
1560
1540
1520
1500
1480
1460

Figure 7

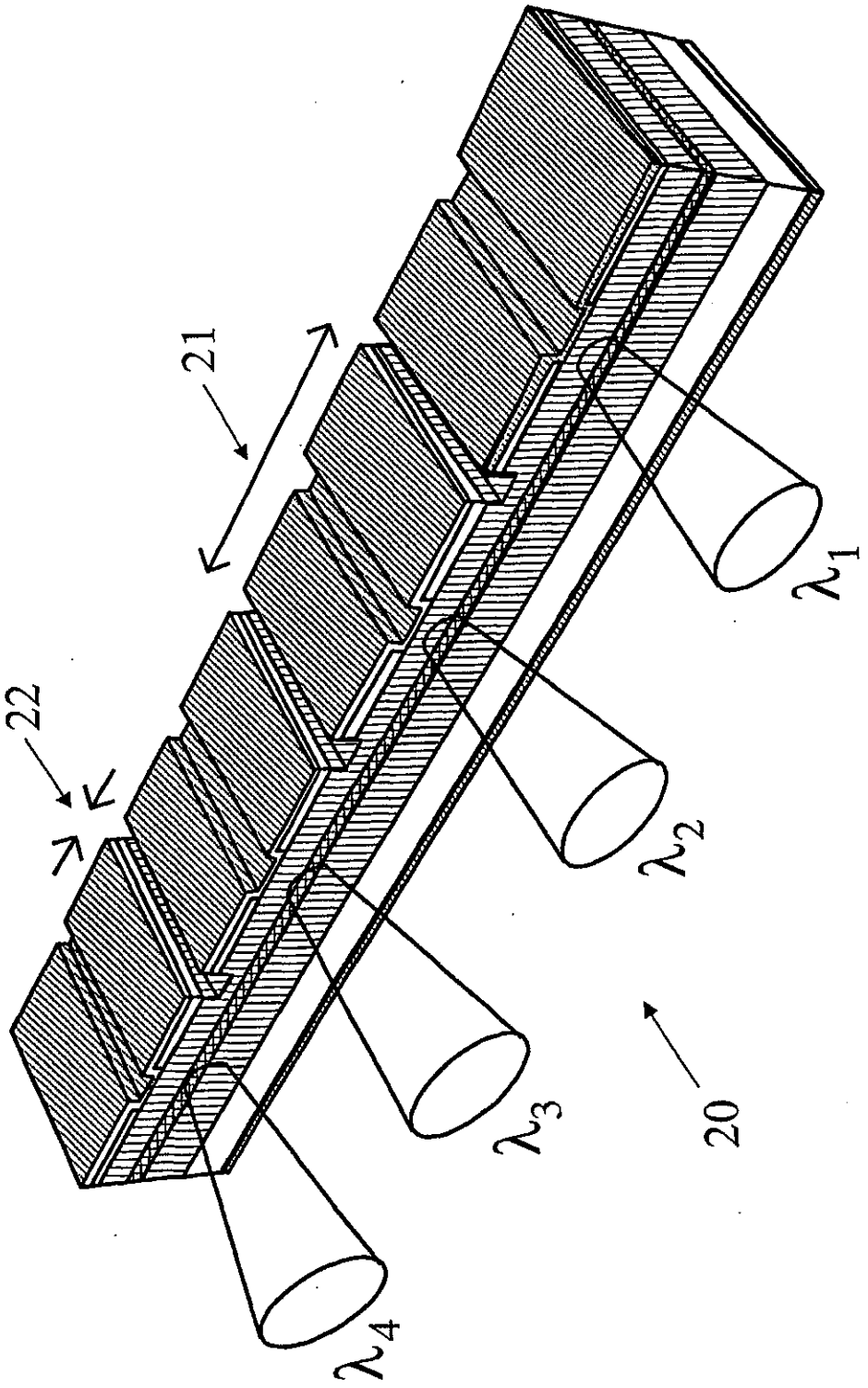


Figure 8

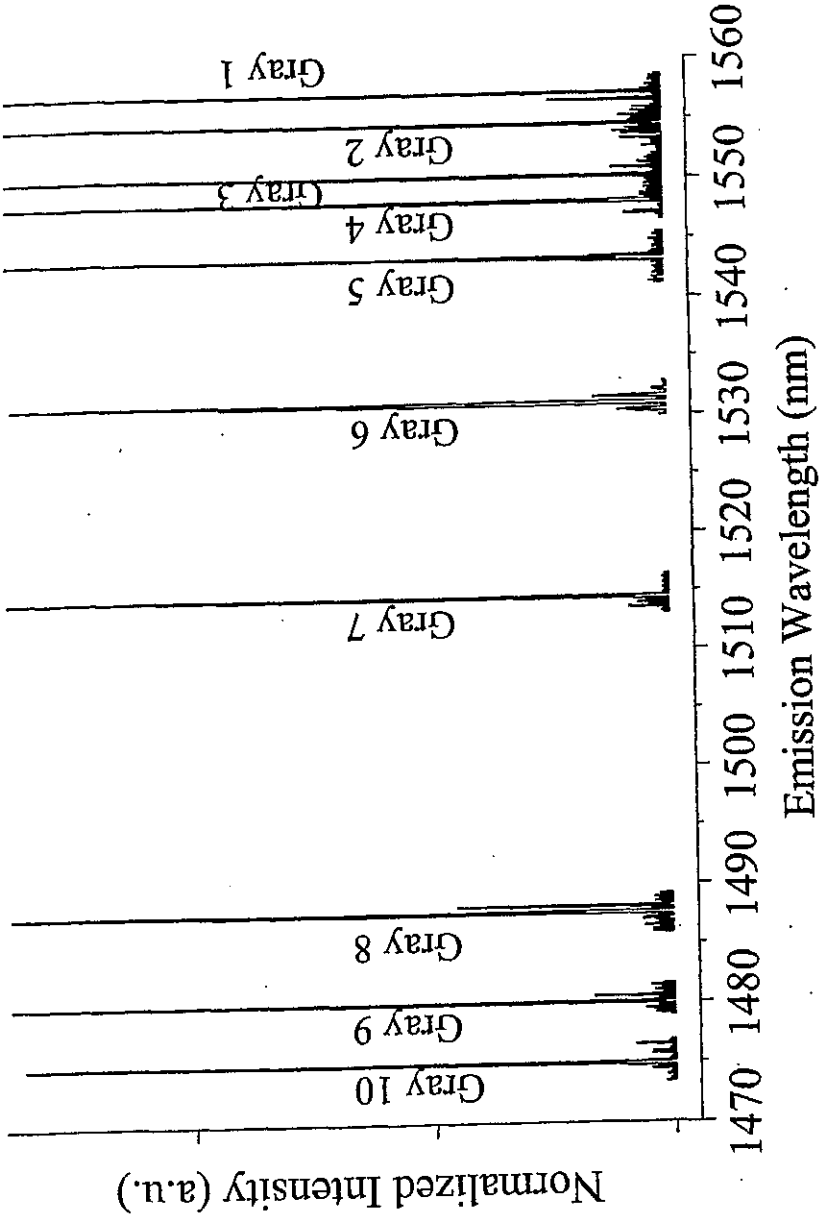

Normalized Intensity (a.u.)
Gray 10
Gray 9
Gray 8
Gray 7
Gray 6
Gray 5
Gray 4
Gray 3
Gray 2
Gray 1
1470 1480 1490 1500 1510 1520 1530 1540 1550 1560
Emission Wavelength (nm)

Figure 9

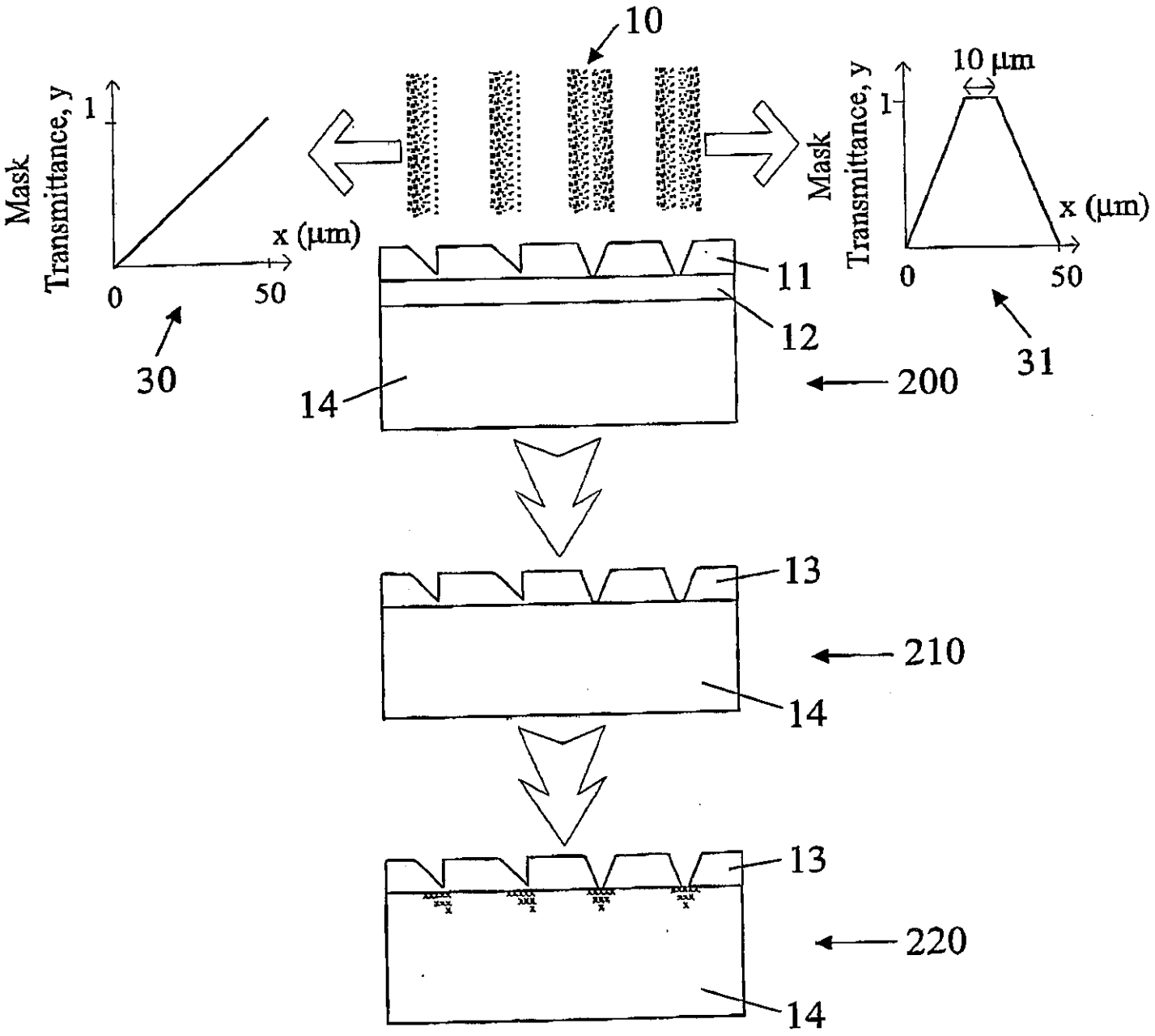

10
Mask
Transmittance, y
1
x (μm)
0
50
30
10 μm
Mask
Transmittance, y
1
x (μm)
0
50
31
11
12
14
200
13
210
14
13
220
14

Figure 10

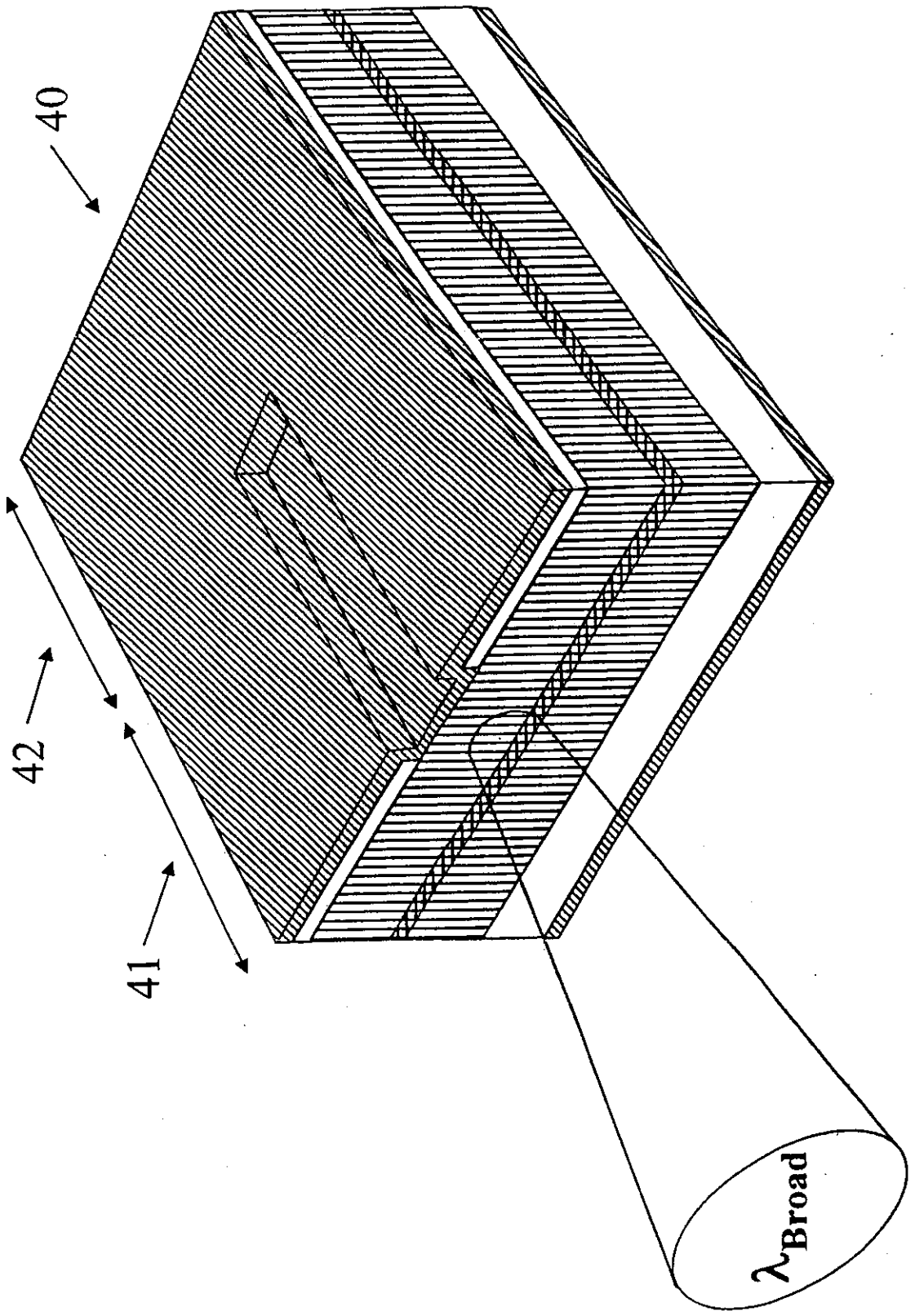


Figure 11

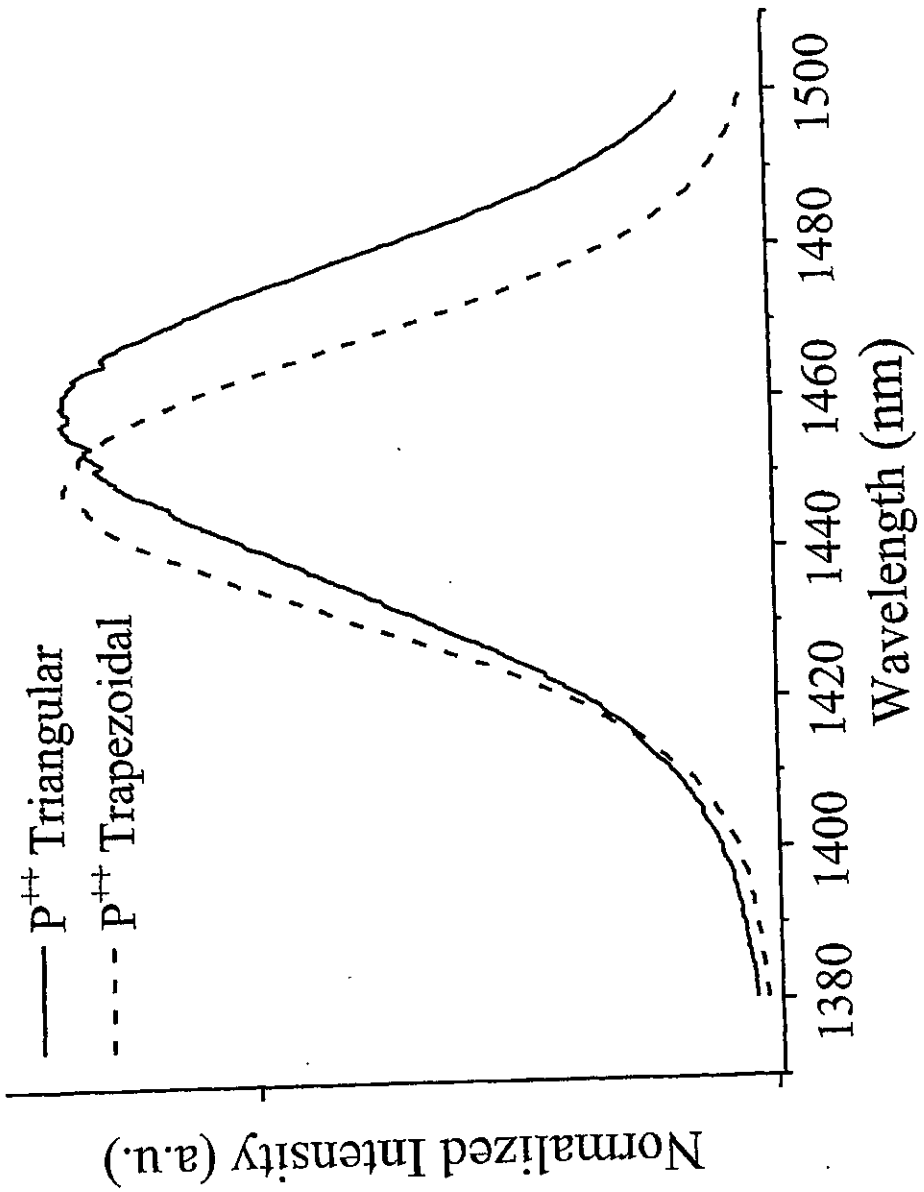

P++ Triangular
P++ Trapezoidal
Normalized Intensity (a.u.)
1380
1400
1420
1440
1460
1480
1500
Wavelength (nm)

Figure 12