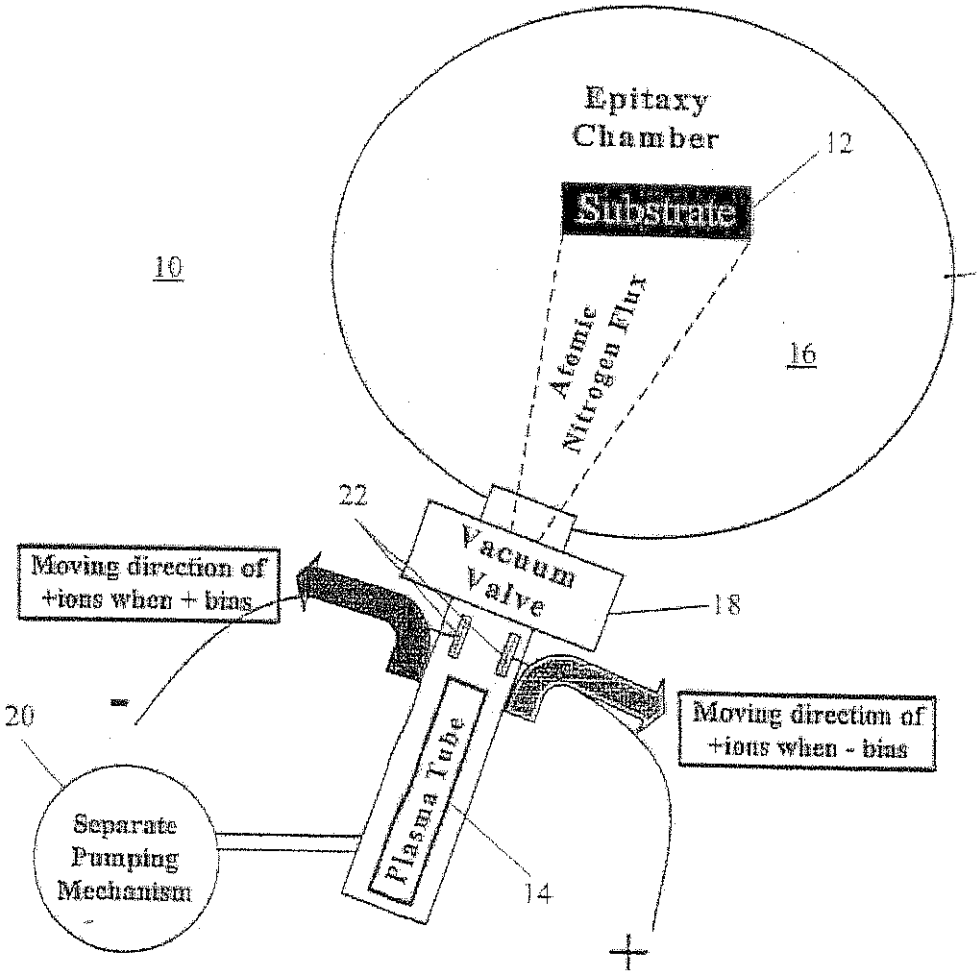

Epitaxy
Chamber
12
Substrate
10
Atomic
Nitrogen Flux
16
22
Vacuum
Valve
18
Moving direction of
+ions when + bias
Moving direction of
+ions when - bias
20
Separate
Pumping
Mechanism
Plasma Tube
14

FIG. 1

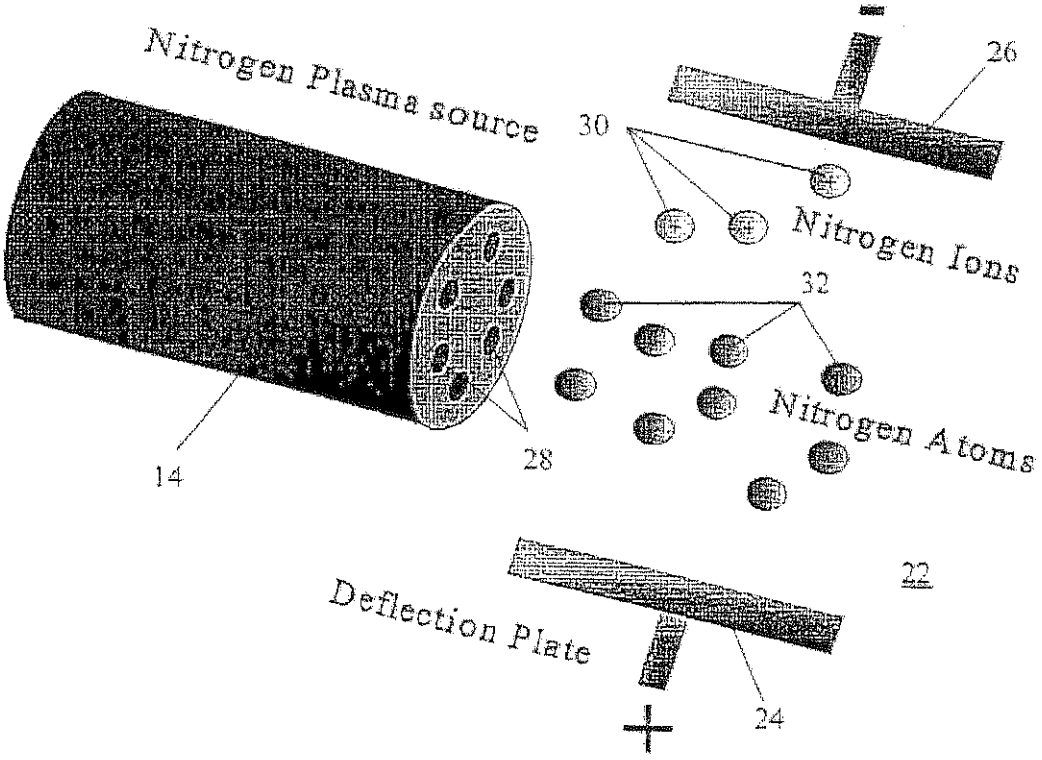

Nitrogen Plasma source
30
26
Nitrogen Ions
32
Nitrogen Atoms
14
28
22
Deflection Plate
24

FIG. 2

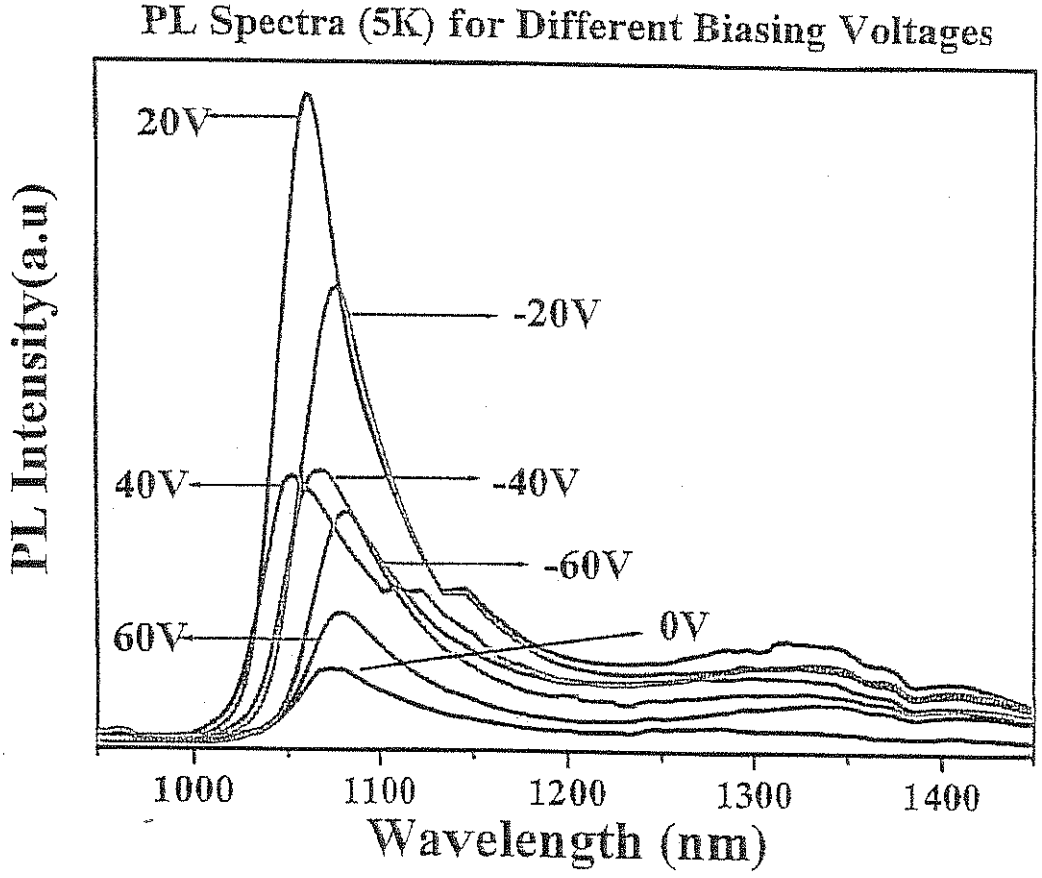

PL Spectra (5K) for Different Biasing Voltages
PL Intensity(a.u)
20V
-20V
40V
-40V
-60V
60V
0V
1000
1100
1200
1300
1400
Wavelength (nm)

FIG. 3

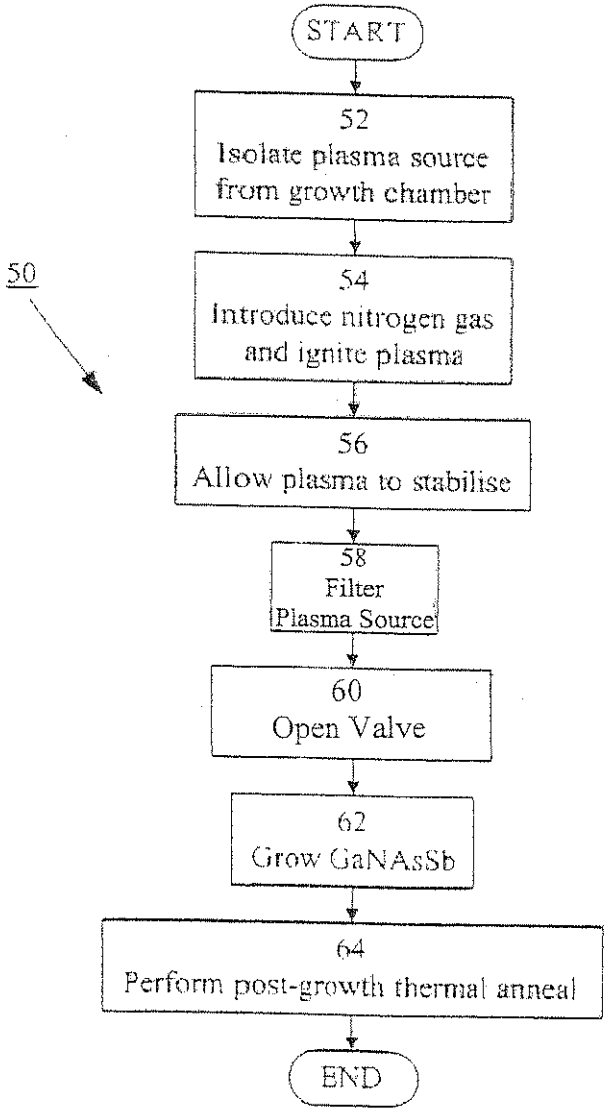

START
52
Isolate plasma source from growth chamber
50
54
Introduce nitrogen gas and ignite plasma
56
Allow plasma to stabilise
58
Filter Plasma Source
60
Open Valve
62
Grow GaNAsSb
64
Perform post-growth thermal anneal
END

FIG. 4

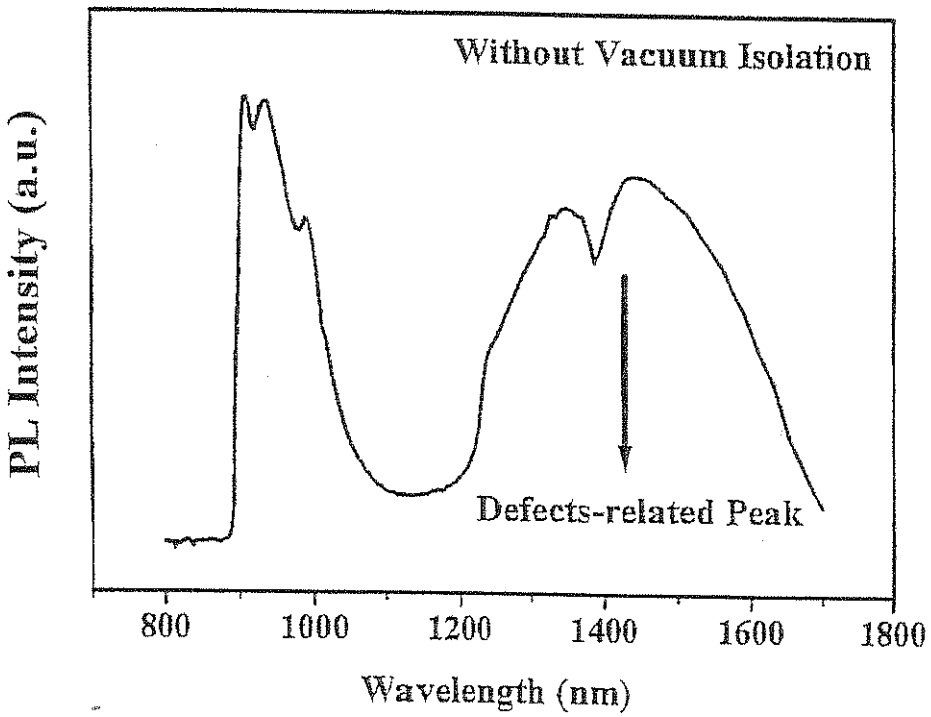

Without Vacuum Isolation
PL Intensity (a.u.)
Defects-related Peak
800
1000
1200
1400
1600
1800
Wavelength (nm)

FIG. 5A

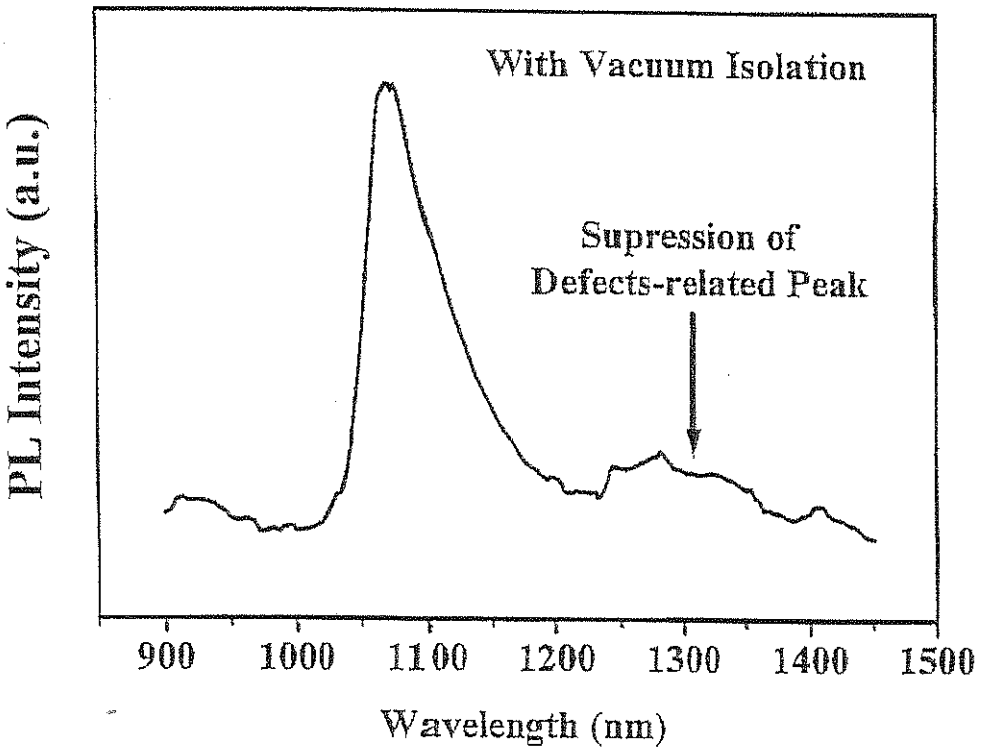

With Vacuum Isolation
Supression of
Defects-related Peak
PL Intensity (a.u.)
900
1000
1100
1200
1300
1400
1500
Wavelength (nm)

FIG. 5B

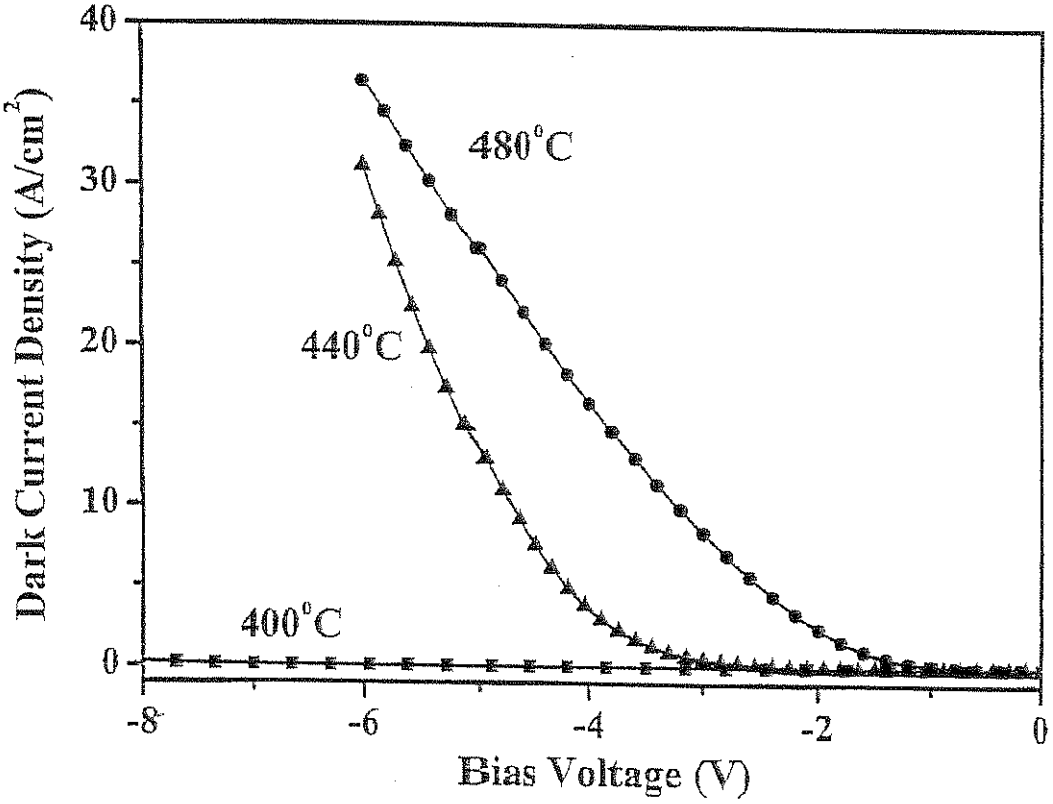

Dark Current Density (A/cm^2)
40
30
20
10
0
480°C
440°C
400°C
-8
-6
-4
-2
0
Bias Voltage (V)

FIG. 6

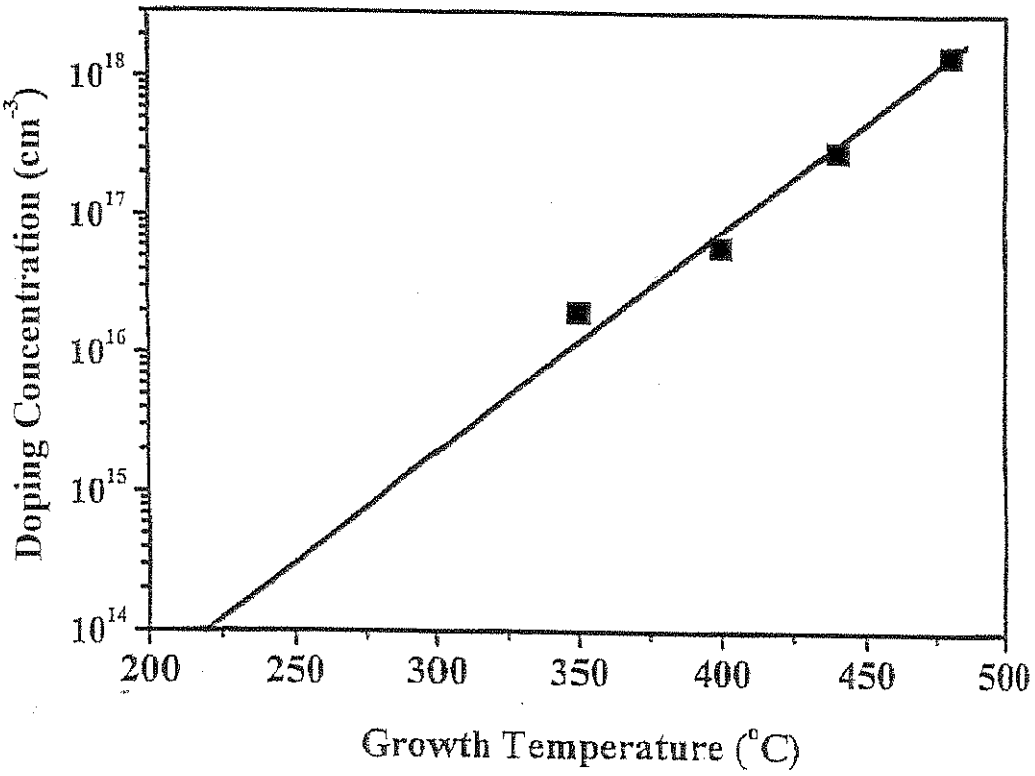

Doping Concentration (cm^{-3})
10^{18}
10^{17}
10^{16}
10^{15}
10^{14}
200
250
300
350
400
450
500
Growth Temperature (^{o}C)

FIG. 7

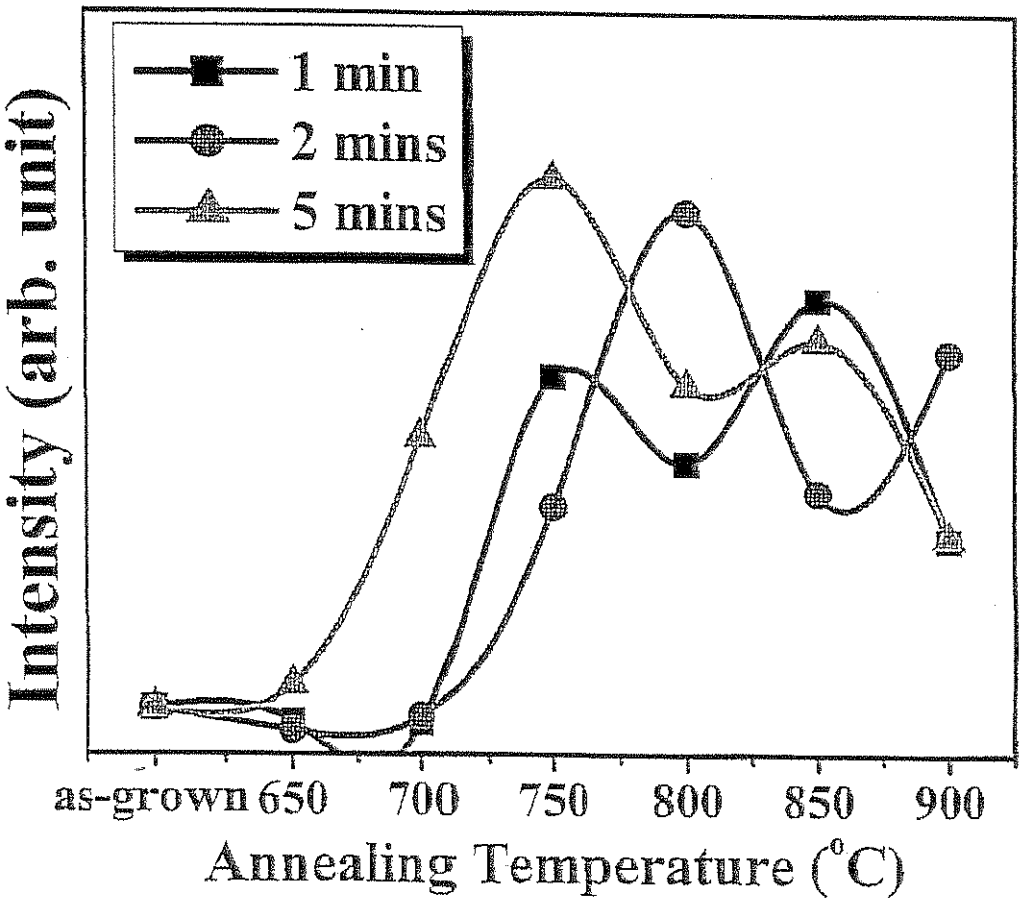

1 min
2 mins
5 mins
Intensity (arb. unit)
as-grown
650
700
750
800
850
900
Annealing Temperature (°C)

FIG. 8

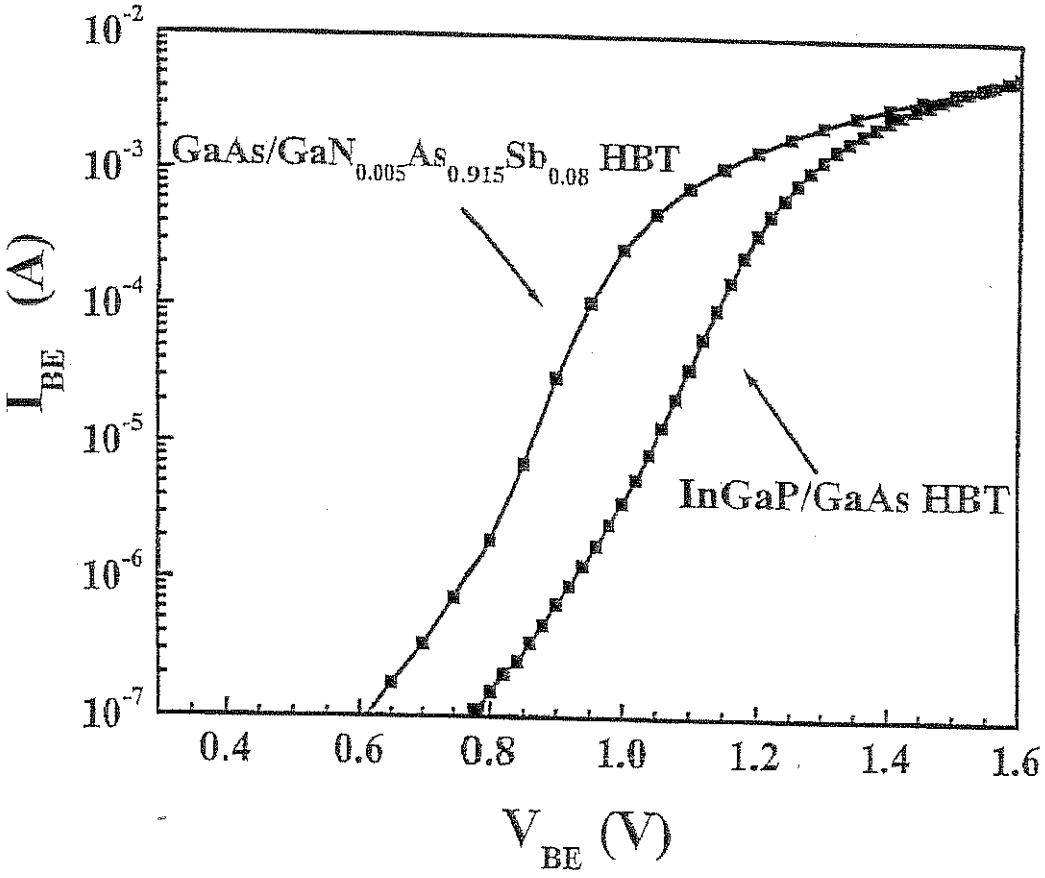

10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
I_{BE} (A)
GaAs/GaN$_{0.005}$As$_{0.915}$Sb$_{0.08}$ HBT
InGaP/GaAs HBT
0.4
0.6
0.8
1.0
1.2
1.4
1.6
V_{BE} (V)

FIG. 9