Fig. 1a

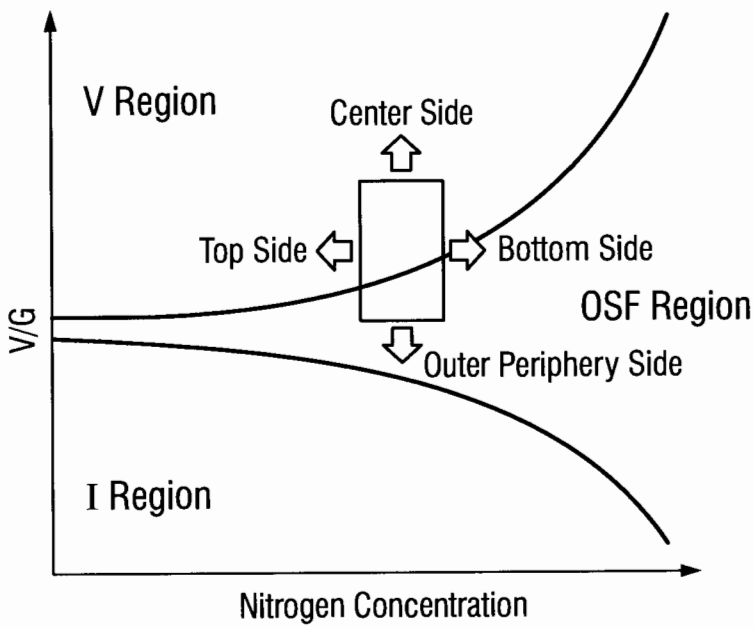

V Region
Center Side
Top Side
Bottom Side
OSF Region
V/G
Outer Periphery Side
I Region
Nitrogen Concentration

Fig. 1b

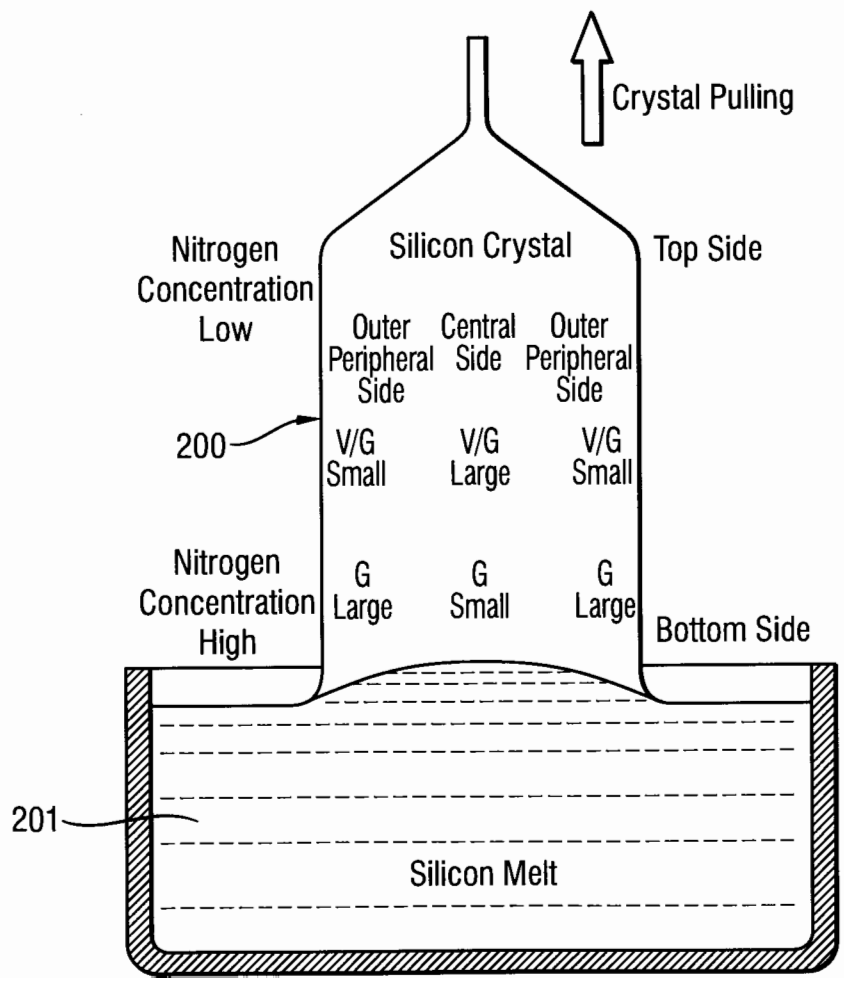

Crystal Pulling
Nitrogen Concentration Low
Silicon Crystal
Top Side
Outer Peripheral Side
Central Side
Outer Peripheral Side
200
V/G Small
V/G Large
V/G Small
Nitrogen Concentration High
G Large
G Small
G Large
Bottom Side
201
Silicon Melt

Fig. 2a

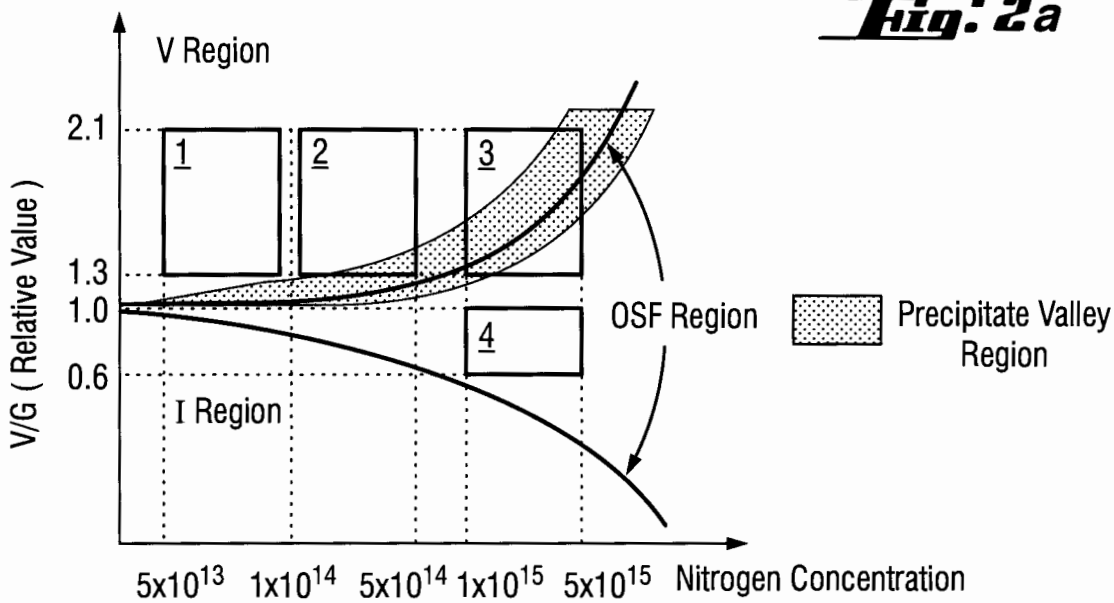


Fig. 2b

	Precipitate Density $5x10^8/cm^3$ or more	Precipitate Density radial distribution variation 0.5 or less
Growth Condition Region 1	×	○
Growth Condition Region 2	○	×
Growth Condition Region 3	○	×
Growth Condition Region 4	○	○

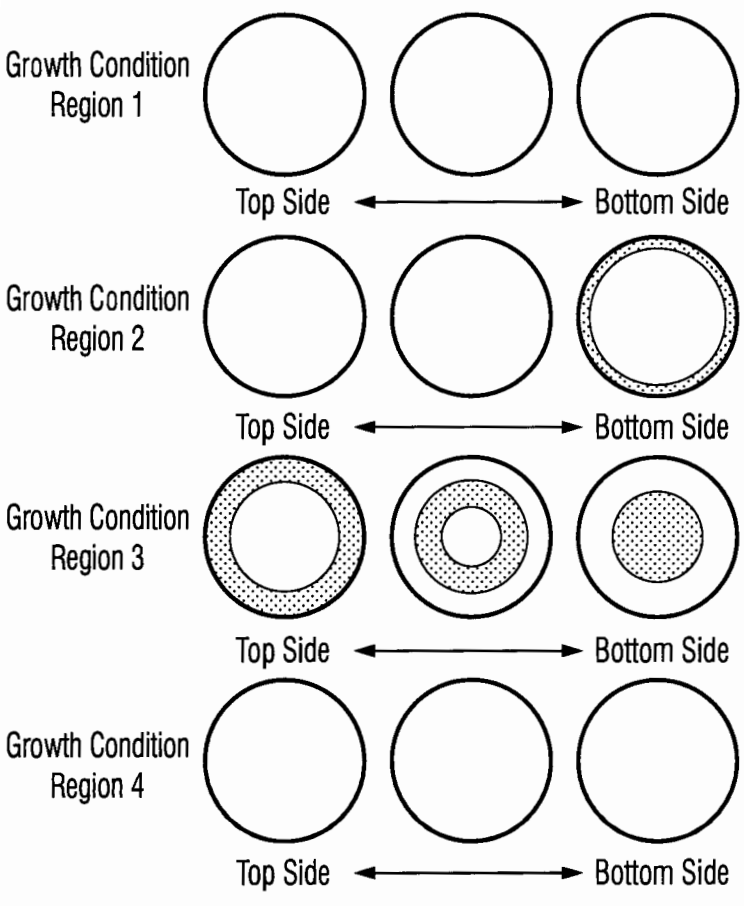


Fig. 3a

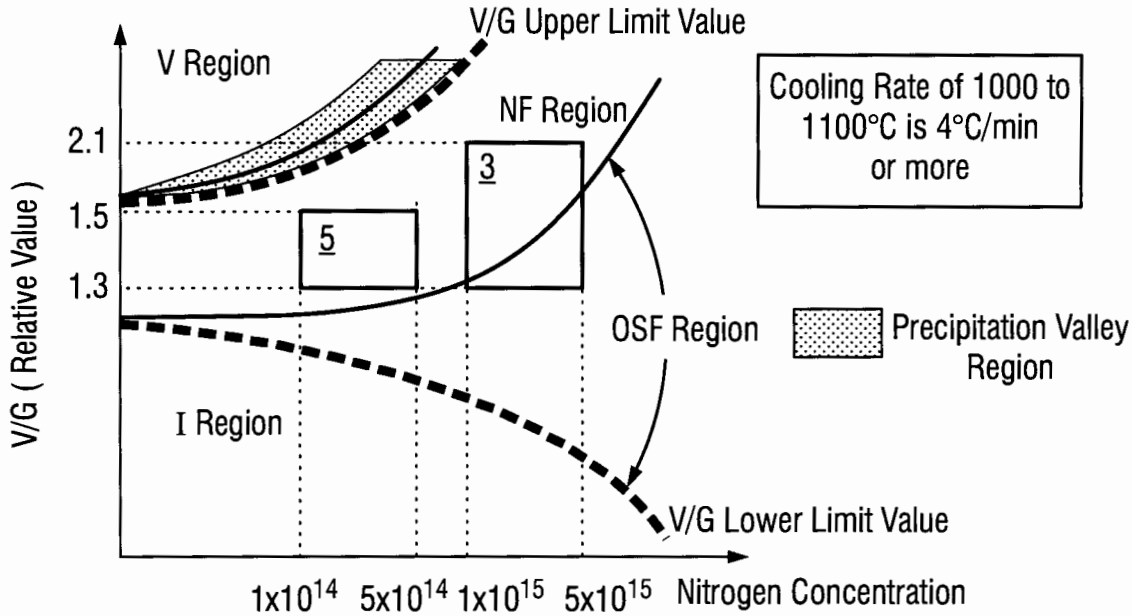


Fig. 3b

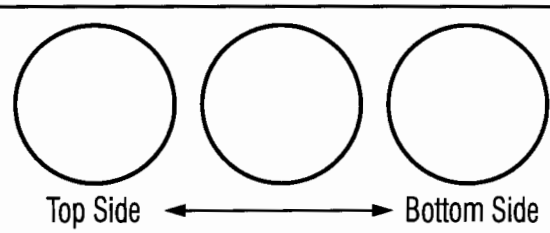
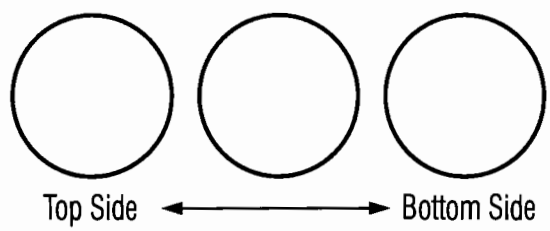
	Precipitate Density $5x10^8/cm^3$ or more	Precipitate Density radial distribution variation 0.5 or less
Growth Condition Region 3  Top Side ⟷ Bottom Side	○	○
Growth Condition Region 5  Top Side ⟷ Bottom Side	○	○

Fig. 4a

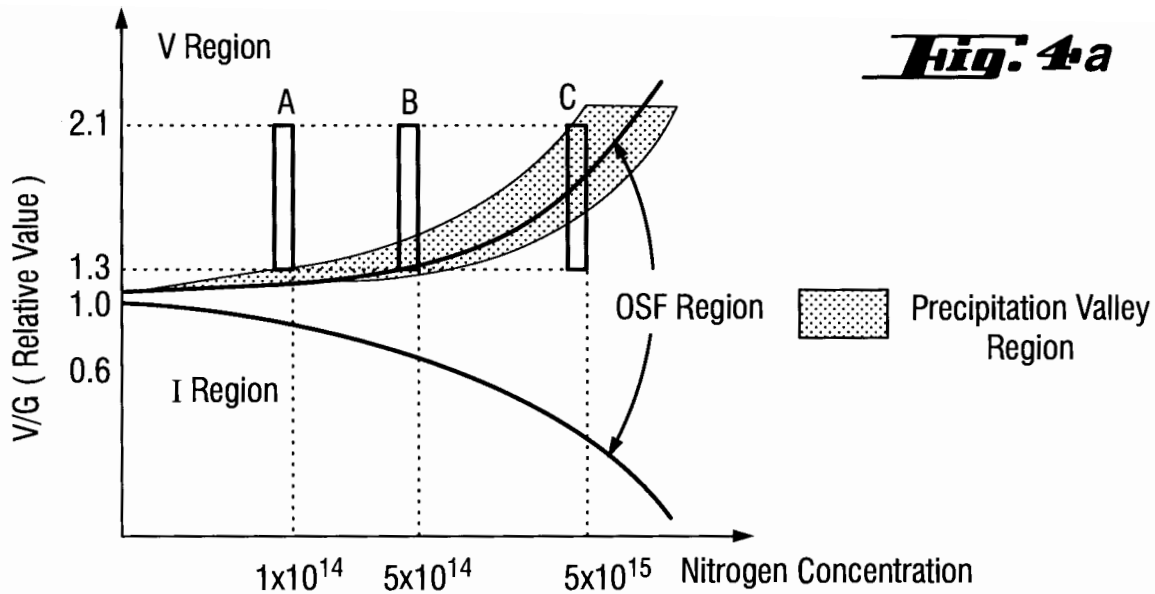
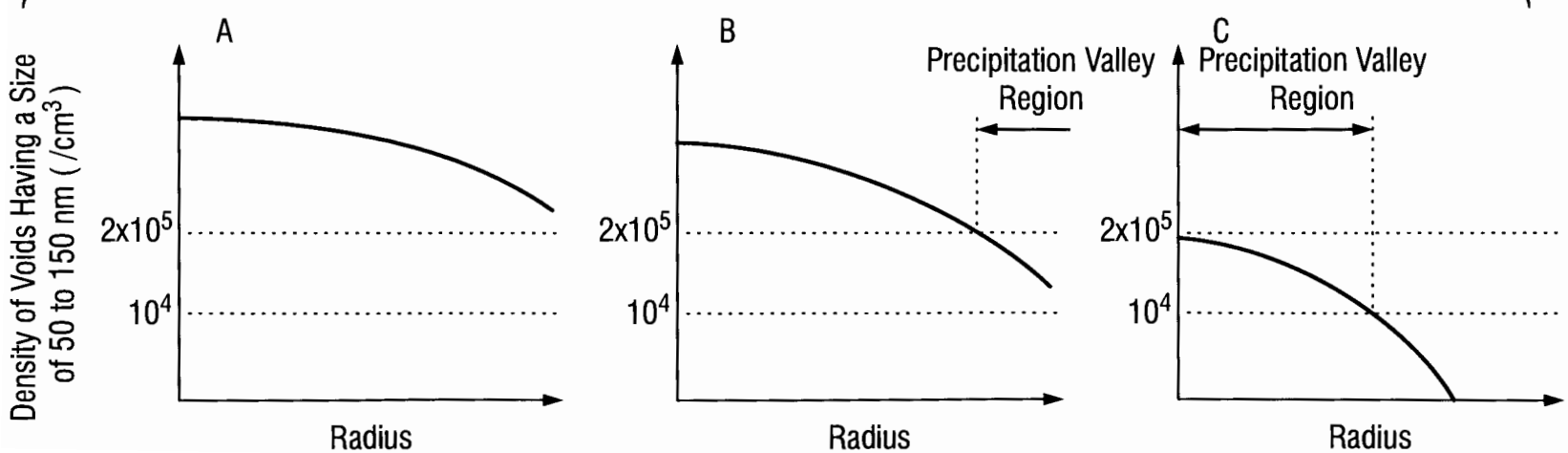

V Region
A
B
C
2.1
1.3
1.0
0.6
V/G (Relative Value)
I Region
OSF Region
Precipitation Valley Region
1x10^14
5x10^14
5x10^15
Nitrogen Concentration

Fig. 4b


A
B
C
Precipitation Valley Region
Precipitation Valley Region
Density of Voids Having a Size of 50 to 150 nm (/cm^3)
2x10^5
10^4
2x10^5
10^4
2x10^5
10^4
Radius
Radius
Radius