24/30

GITAM

(Deemed to be University)
(Estd. u/s 3 of UGC Act, 1956)
HYDERABAD CAMPUS - 502 329

MID TERM / PRACTICAL EXAMINATION

Name of the Student S-Vyshnavi Reddy Roll No. 222010407014 Branch ECE(VLSI)

Course Code 19EEC458 Course Name Fundamentals of VLSI device Fabrication Date 28/02/24

Mid I, II, III / Section II Invigilator Signature

Question No.	1					2	3	4	5	6	Total Marks
	A	B	C	D	E						
Marks											

1) Diffusion :-

a) Diffusion is the process of two-step diffusion sequence is commonly used in which a predeposition diffusion layer is formed under a constant surface - concentration. condition and is followed by a drive - in diffusion or redistribution under a constant ~~total~~ dopant condition. Adding impurities atoms from a region with high concentration to a region of low concentration

1

2) b) The diffusion coeffient is a parameters constant dependent on molecule size and other properties of the diffusion substance as well as on temperature and pressure.

2

* Solid solubility
* Diffusion - time
* Diffusion temperature

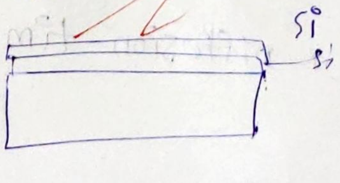
c) Etching

* Strain gauges
* Galvanometer Mirror frames
* Electrical contacts and terminals
* Gaskets for meters

d) BULK Micromaching is a process used to produce Micromachinery unlike surface micromachining which uses a succession of thin film desposition and selective etching, bulk micromachining defines structures by selectively etching inside a substrate. whereas surface Micromachining creates structures on top of a substrate, bulk machining produces structure inside a substrate

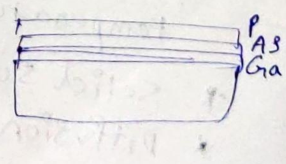
e) Homo Eptaxy

* In homo the growth layers are made up of the same materials of the substrate



Hetero Eptaxy

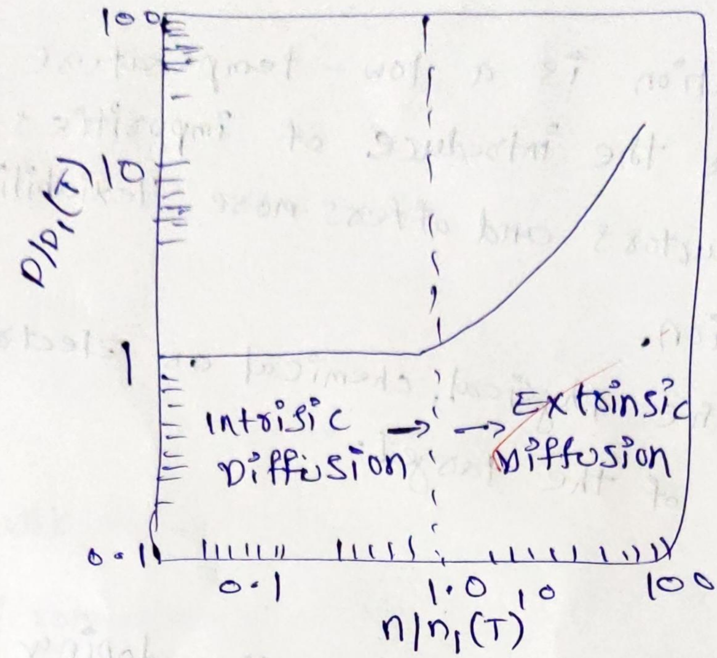
* In Hetero the Growth layers are of a Material different from the substrate



f) Ion Implementation is a low-temperature technique for the introduce of impurities (dopants) into semiconductors and offers more flexiability than diffusion.

* changing the physical, chemical or electrical properties of the target.

g) Diffusion that occurs when the doping concentration is lower than the intrisinic earner concentration at the diffusion temperature is called intrisinic diffusion.
In this regio, the resulting dopant profiles of sequential or simultanieous diffusion type of n-type or p-type impurities can be determined by superposition, that is the diffusion processes can be treated independently.
However, when the dopant concentration exceeds (e.g. at 1000°C, $n_i = 5\times10^{18}$ atoms/cm^3 the process becomes extrinsic and diffusion coefficients become concentration dependent as become



In order to make diffusion calculations of reasonable accurancy fair's diffusivity model will be presented in the next few sections. Fair has developed a model for diffirsivity based on impurities interactions with charged vacancy states that provides a resonable good fit to most observed diffusion ressults.

$D_i = D^0 + D^+ + D^- + D^= +$ for n or $p << n_i$

D^+ is the positively charged vacancy impurity diffusion D^- is a negatively charged vacancy impurity diffusion and $D^=$ is the doubly negatively charged vacancy - impurity diffusivity and n_i is the intrinsic carrier concentration for extrinsic silicon

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$$D_x = D^0 + D^+\left[\frac{p}{n_i}\right] + D^-\left[\frac{n}{n_i}\right]^2 \text{ for } n \text{ or } p >> n_i$$

* where D_x is the extrinsic diffusivity for unambiguous impurities not all vacancy change state - impurity combinations will participate in the diffusivity.
* In order to growth the silicon wafer we need to use the intrisic and Extrinsic semiconductors

8½

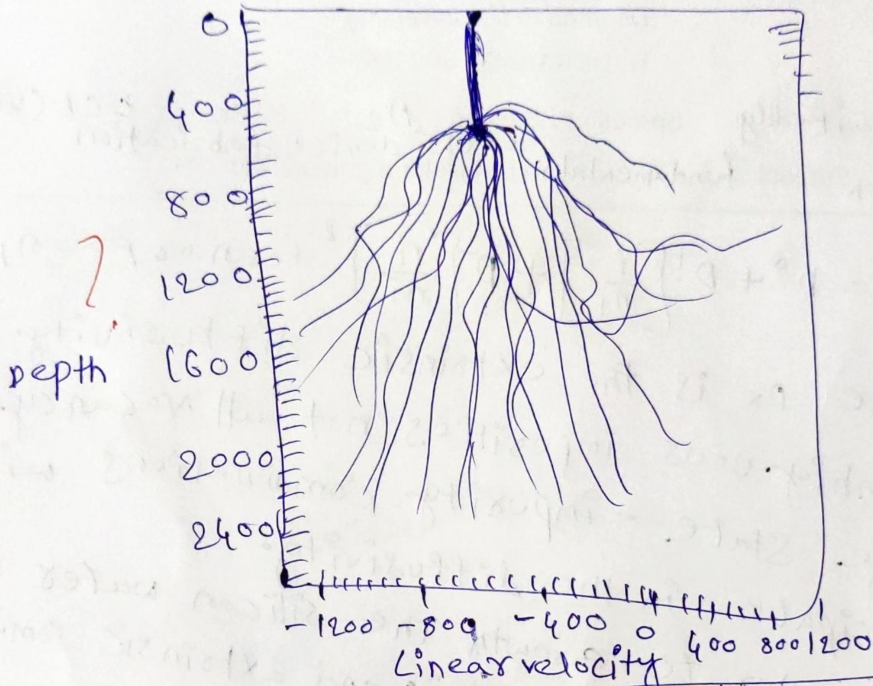
5) Ion Implantation :-

Ion Implantation is a low-temperature technique for the introduce of impurities (dopant) into semiconductors and offers more flexiability than diffusion.

* In changing the physical, chemical or electrical properties of the target.

* $$S = \left[\frac{dE}{dx}\right]_{nuclear} + \left[\frac{dE}{dx}\right]_{electrical}$$

7



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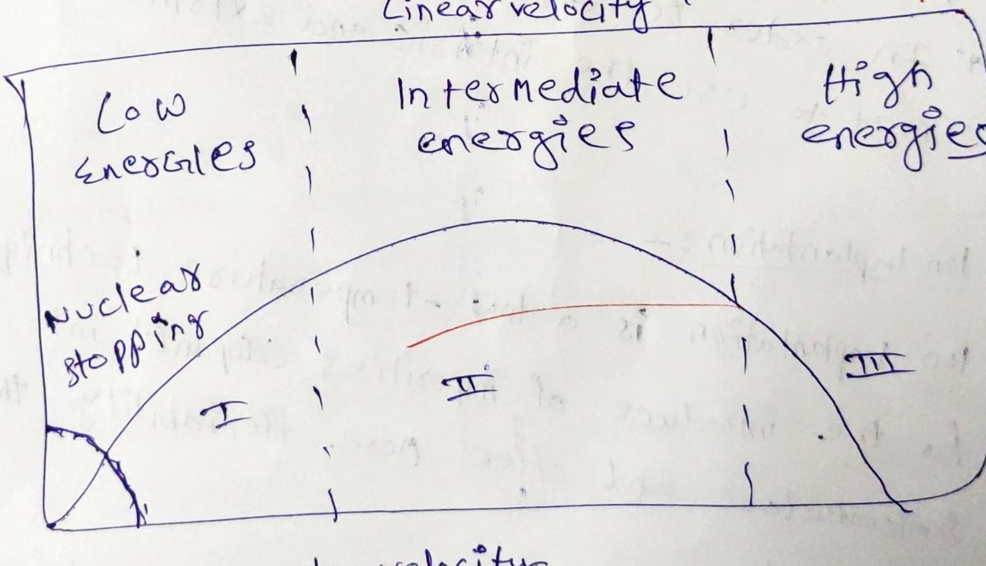

Annealing is the process of treating the grown material at high temperature around (500 - 800°c) to remove the defects and together implantation throughout the substrate materials.