Lecture - I

Note Title 8/1/2014

3.3

Free carriers $\sim 10^{22}/cm^3$ (conductor)

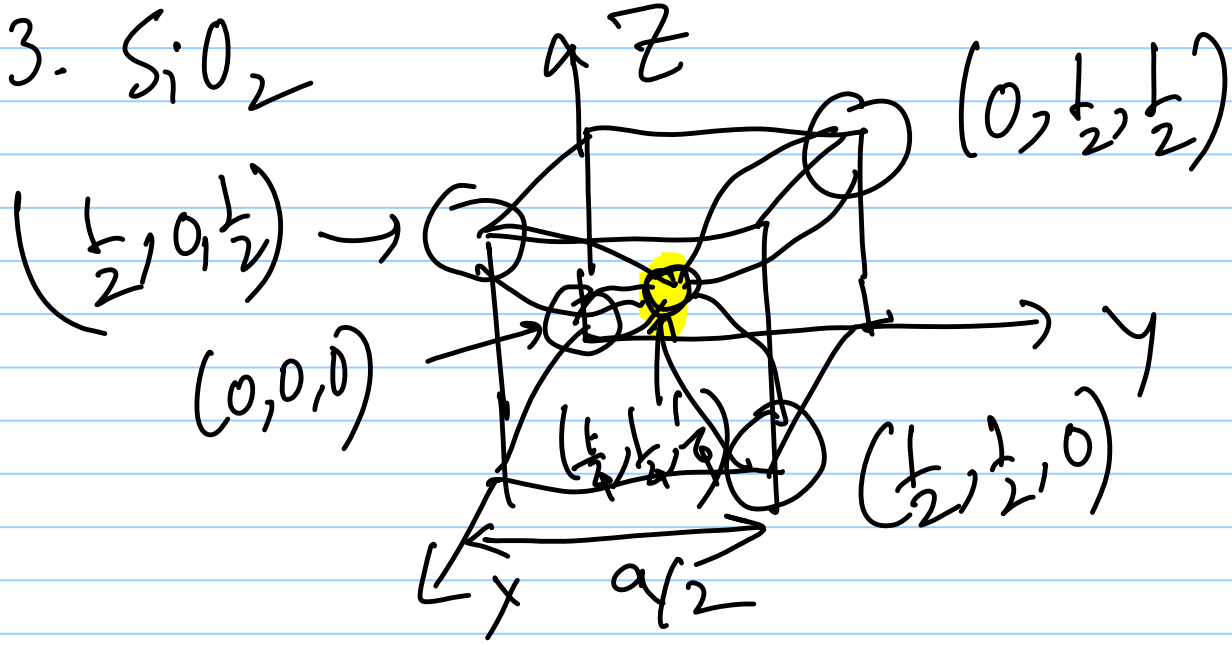
Bond Model - $10^6 - 10^{17}/cm^3$ (semi-c)

$1 - 10/cm^3$ (Ins.)

1. Availability

2. High Temp Operations (200°C)

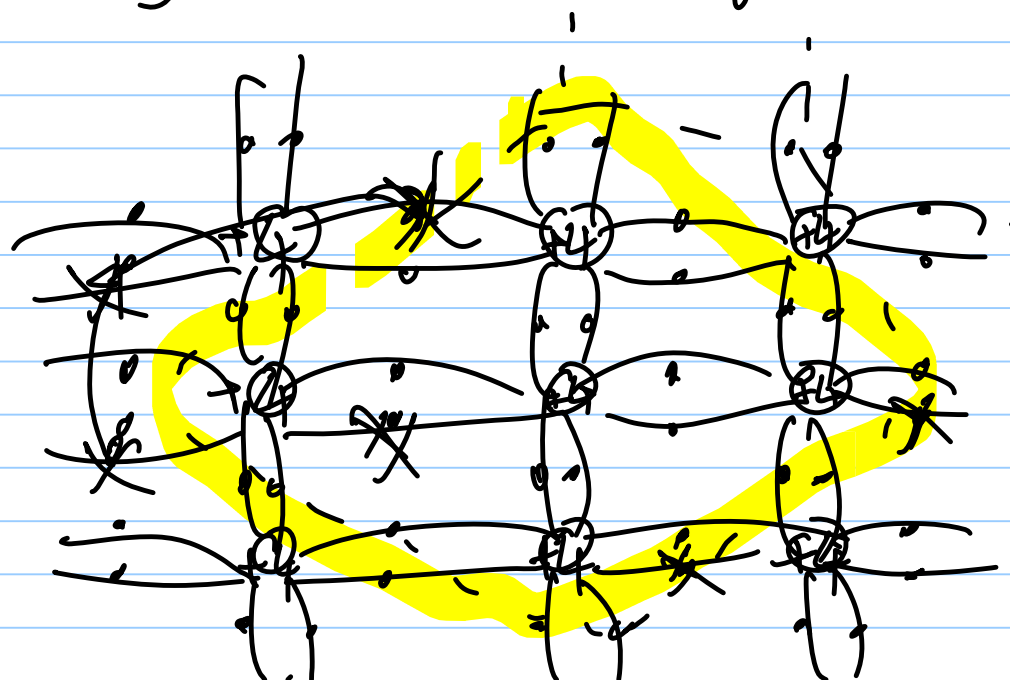
3. SiO_2



a → lattice const.

Si → 14 → $1s^2 2s^2 2p^6 3s^2 3p^2$

Sharing is bonding

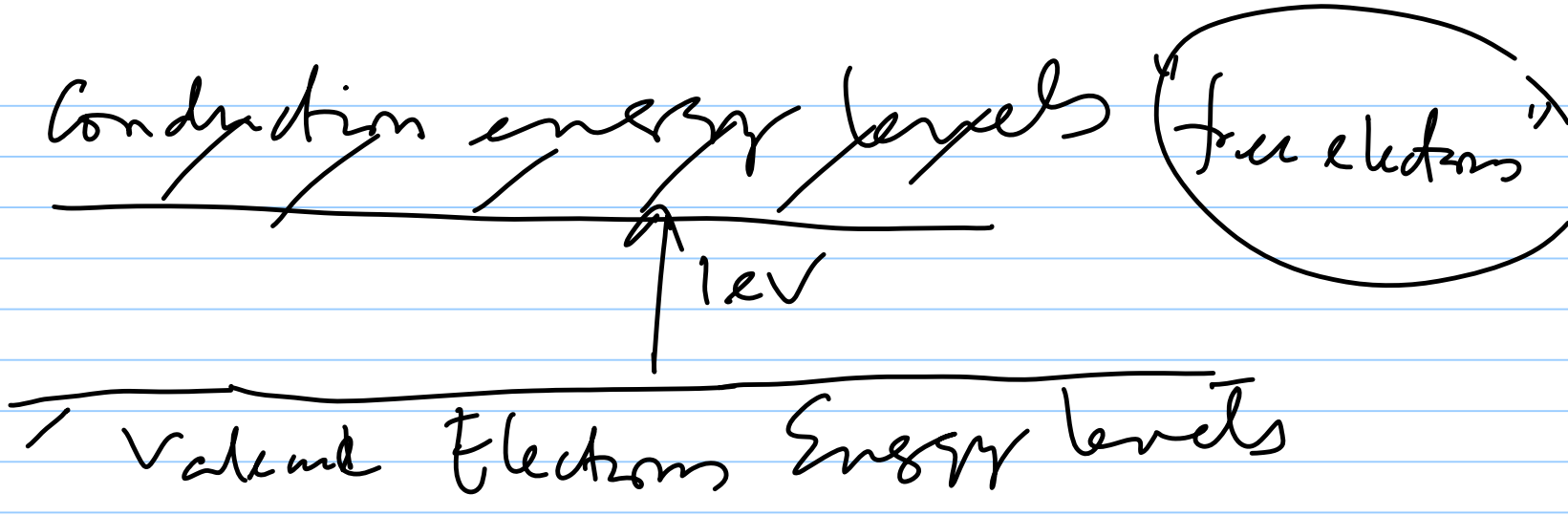


At T = 0 K

T = 300 K

1 eV

Ionization energy



Vacant states → +ve charge
↳ means equivalent of electrons

→ hole

$n \rightarrow$ no. of free e^-/cm^3

$p \rightarrow$ no of holes $/cm^3$

$$\boxed{n_i = n = p}$$ T,

Intrinsic Carrier Conc.

Intrinsic Semicon

$$n_i\Big|_{Si} \approx 10^{10}/cm^3$$

Charge neutral

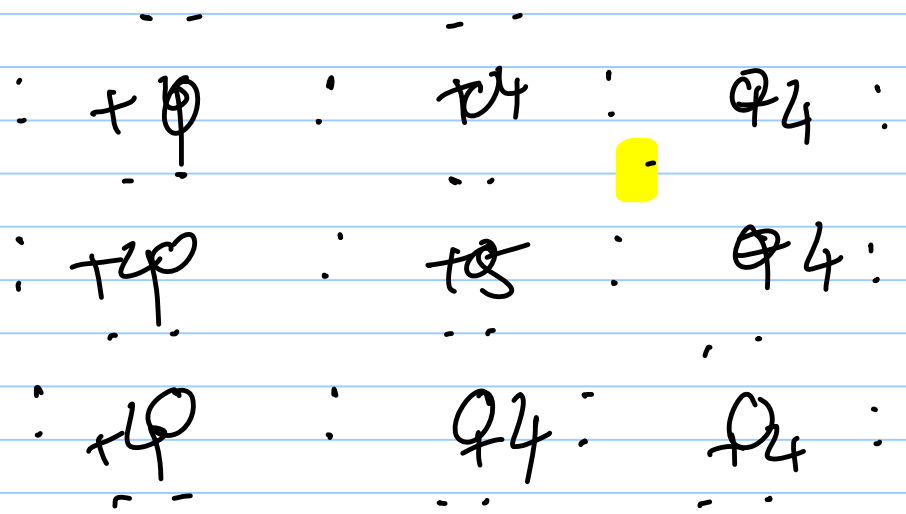
$$n = p = n_i$$

Extrinsic Semiconductor

Doping

Group - IV (Si, Ge)

Dopants: Group - III, Group - V



1 eV

0.1 eV

$kT \sim 25.9$ meV

$n_i \simeq 10^{10}/cm^3$

$n = 10^{16}/cm^3$

Si $\rightarrow 10^{22}/cm^3$

charge neutrality

$n \neq p$