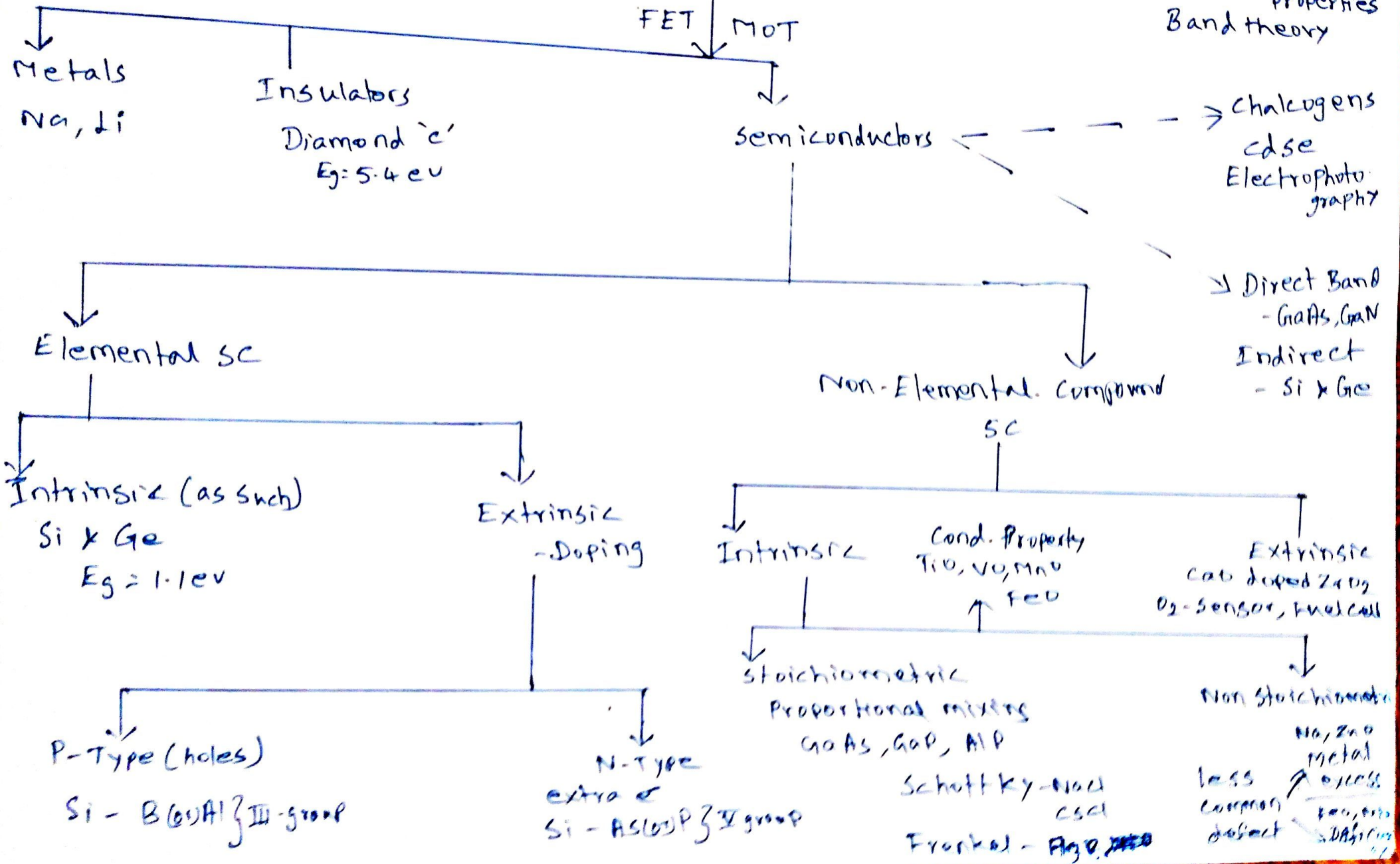


I Unit Conducting Properties of Materials

Quantum Dot
Size Vs optical
properties
Band theory



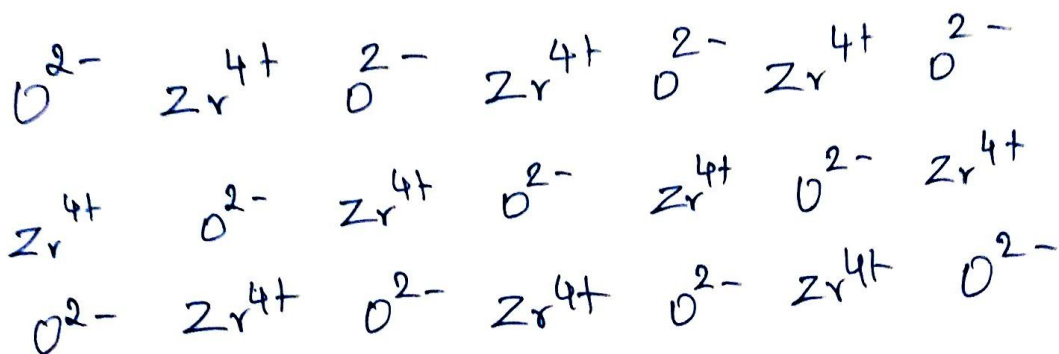
Extrinsic - Crystal Defect

- Addition of foreign material

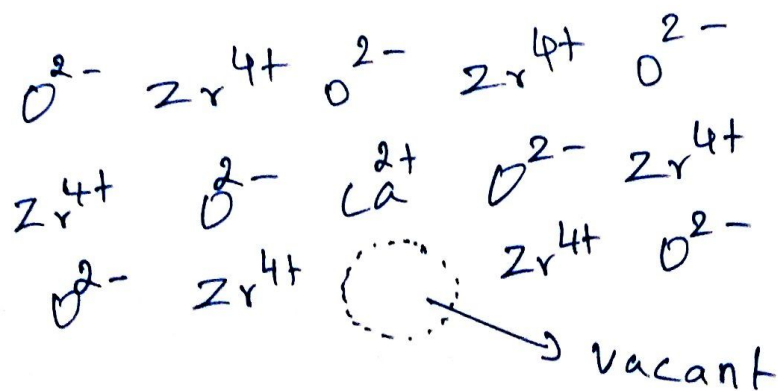
Ex: ZrO_2 (Zirconium oxide)



Lattice - Atomic Ratio - $\frac{1-Zr^{4+}}{2-O^{2-}}$



CaO - Doped - ZrO_2



CHARGE - Neutrality; vacant generated
ionic conductivity

Applications \nearrow O_2 - sensor
 \searrow Fuel Cell

O_2 - Sensor

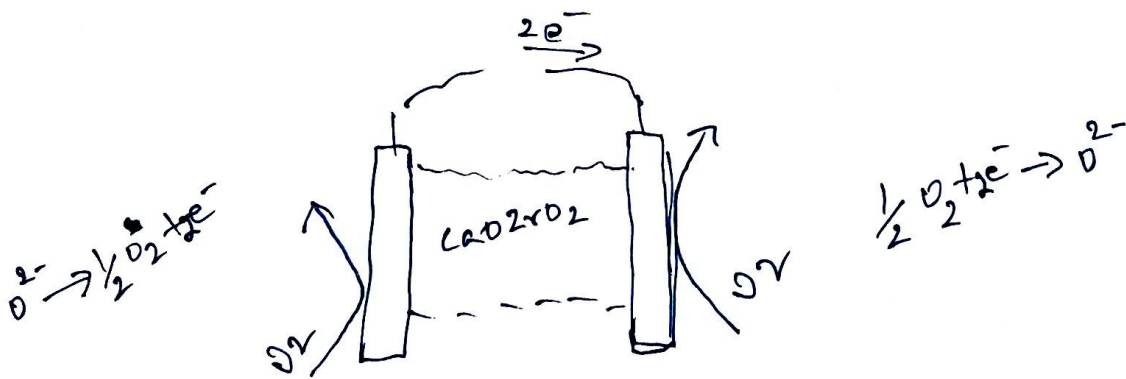
$CaO-ZrO_2$ - used as Electrolyte.

O^{2-} - Diffusion

Dimensionally stable Electrode (DSE)

Anode \checkmark

Cathode \searrow



A -
Analyte O_2

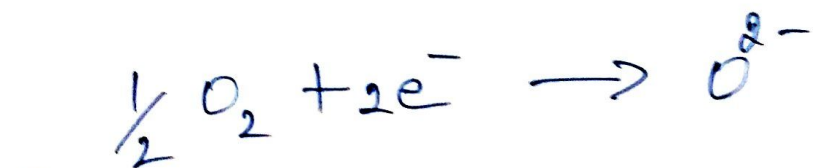
B
std - O_2 (100% Pure)

Material - Transfer from Higher concentration
 side to lower concentration

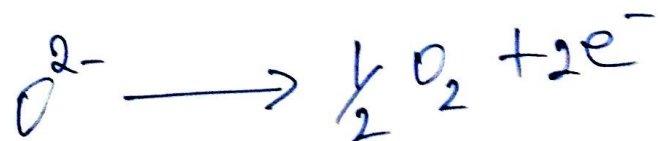
In case, analyte (A) has low partial pressure, i.e low concentration

The Reactions

B - side

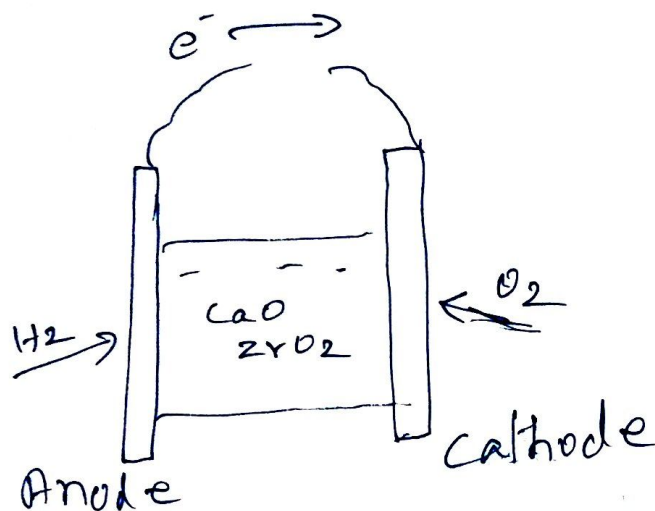


A - side



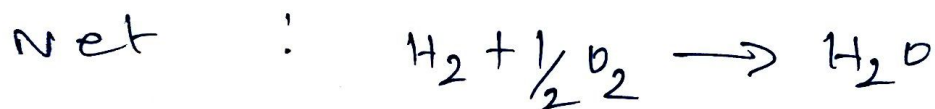
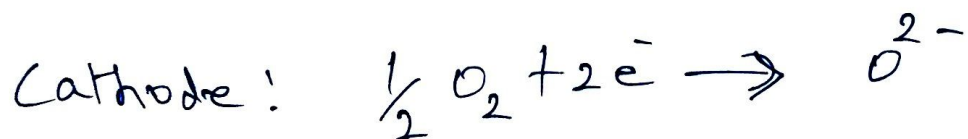
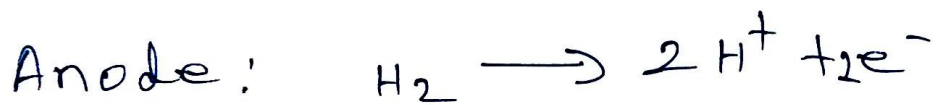
O^{2-} Diffuses from B (higher concn) to A
through the electrolyte $CaOZrO_2$

Solid oxide Fuel cell (SOFC)



Electrodes - Anode - oxidative Catalytic
Cathode - Reductive catalytic

Electrolyte: CaO ZrO_2



O^{2-} Diffuse from cathode to Anode
through the CaO ZrO_2