

MATERIALS SCIENCE

UNIT – I

Bonding in solids – ionic. Covalent, metallic and secondary bonds. Structure of solids – effects of radius ratio on co-ordination number. Structure of common metallic. Semiconducting. Polymeric, ceramic and glassy materials: point, line and surface defects – edge and screw dislocation. Energy of dislocations. (18 hours)

UNIT – II

Solid solutions – intermediate phases and intermetallic compounds, unary and binary phase diagrams – iron – carbon phase diagram, phase transformation – nucleation and growth: solidification. Crystal growth and zone refining; precipitation hardening; recrystallization and crystal growth. (18 hours)

UNIT – III

Electrical and electronic behaviour of solids: electrical conductivity: free electron and band theory of solids : intrinsic and extrinsic semiconductors: p-n junctions and applications. Solar cells : photo voltaics; superconductivity. (18 hours).

UNIT – IV

Point defects-colour centers: solid electrolytes and their applications in batteries, nonstoichiometric compounds – NiO, FeO, MnO. Magnetic behaviour of materials – dia, para, ferro and anti ferromagnetism – applications – dielectric behaviour – polarization, piezo and ferroelectricity. (18 hours)

UNIT – V

Optical properties – refractive index, absorption and emission of light, photoconductivity: phosphore in fluorescent lamps: photography, photocopying: ruby and gallium arsenide lasers. Special materials – zeolites – catalysis; fullerenes, conducting polymers – polyacetylene, tetrathiafulvalene – tetracyanoquinones (TTF – TCNQ) (18 hours)

REFERENCES:

1. 'Solid State Chemistry and its Application A.R.West.
2. 'Solid State Chemistry NB Hannay'
3. 'Structural Inorganic Chemistry A.F.Wells, Clarendon, Oxford, 5th edn. 1984.
4. 'Introduction to Solids L.Azaroff. 1970, Tata McGraw Hill
5. 'Introduction to Solid State Physics C.Kittel, Wiley Eastern, 1974.
6. Csicsery, S.M.(1985), Chem. Britain p 473 (zeolites)
7. Dwyer, J & Dyer A (1984), Chem & Industry p.237 (zeolites).