

# AMCT04 PROPERTIES OF CERAMICS

## UNIT-1 MECHANICAL PROPERTIES

- 1.1 Plastic deformation of different crystals,
- 1.2 Creep in single crystal, polycrystalline, refractories.
- 1.3 Viscous flow of liquids and gases.
- 1.4 Elastic moduli, an elasticity, brittle fracture and crack propagation, strength and fracture surface work experience, static fatigue, creep fracture, effects of microstructure.

## UNIT-2 THERMAL PROPERTIES

- 2.1 Heat capacity, density and thermal expansion of glasses, crystals, composite bodies.
- 2.2 Thermal conduction- phonon conductivity of single phase crystalline ceramics and glasses,
- 2.3 Photon conductivity, conductivity of multiphase ceramics, thermal stress,
- 2.4 Temperature gradients, resistance to thermal shock and thermal spalling,
- 2.5 Thermal tempering and annealing.

## UNIT-3 OPTICAL PROPERTIES

- 3.1 Introduction, refractive index and dispersion, reflection and refraction,
- 3.2 Absorption, scattering, polarisability,
- 3.3 Boundary reflectance and surface gloss, opacity and translucency,
- 3.4 Absorption and colour, application.

## UNIT-4 ELECTRICAL PROPERTIES

- 4.1 Electrical conduction phenomena,
- 4.2 Ionic conduction in crystals and glasses, electronic conduction in crystals and glasses,
- 4.3 Non-stoichiometry and solute controlled electronic conduction, valency controlled semiconductors, mixed conduction in poor conductors, poly crystalline ceramics,
- 4.4 Electrical phenomena, dielectric loss factor for crystals and glasses, dielectric conductivity, polycrystalline and polyphase ceramics, dielectric strength.

## UNIT-5 MAGNETIC PROPERTIES

- 5.1 Magnetic phenomena, origin of interactions in ferromagnetic materials,
- 5.2 Spinel ferrites, rare earth garnets, ortho ferrites and illmenites, hexagonal ferrites,
- 5.3 Polycrystalline ferrites, susceptibility, permeability, flux density,
- 5.4 Types of magnetism and their origin, electronic structure and magnetic moment,
- 5.5 Exchange interaction and super exchange interaction, hysteresis loop and magnetic domain-domain structure.

## References Books:

1. David W. Richerson, Modern Ceramic Engineering, 3rd Edn. Taylor and Francis, 2005.
2. Moulson A.J and Herbert H. M, Electro ceramics, Chapman and Hall, London, 1990.
3. Allen Dinsdale, Pottery Science: Materials, Processes and Products, Ellis Horwood Ltd., NY, 1986.