

AMPL26 EVALUATION & TESTING OF POLYMERS

UNIT-1 THERMAL PROPERTIES OF POLYMERS

- 1.1 Glass transition temperature, melting temperature, heat distortion temperature, etc.
- 1.2 Sample preparation, standardization, conditioning of sample, process ability test, dynamic mechanical analysis, melt flow rate,
- 1.3 Vicat softening temperature. Study of a dilatometer.
- 1.4 Study of thermo-chemical analysis and differential scanning calorimeter and their applications to polymers with suitable examples.

UNIT-2 STRUCTURAL EVALUATION OF POLYMERS

- 2.1 Principles, theories and applications to polymeric systems with suitable illustration of the following techniques:
- 2.2 Fourier transform infrared spectrometry, Ultraviolet - visible spectrometry, Nuclear magnetic resonance spectrometry, Mass spectrometry, X-ray diffraction spectrometry, Gas chromatography.

UNIT-3 MOLECULAR WEIGHT DETERMINATION

- 3.1 Study of the respective principles, theories and applications by the following techniques:
- 3.2 Gradient elution technique, Gel permeation chromatography, Vapor pressure osmometry, Cryoscopy and ebullioscopy.

UNIT-4 VISCOSITY OF POLYMER SOLUTIONS AND POLYMERS

- 4.1 Their significance,
- 4.2 Application to polymers using different viscometers.

UNIT-5 ELECTRICAL PROPERTIES

- 5.1 Surface volume resistivity, Breakdown voltage, Arc resistance, Tan Delta, etc.
- 5.2 The theory behind these phenomena, application to polymers and evaluation.

UNIT-6 MECHANICAL PROPERTIES

- 6.1 Their principles and applications to polymers, Tensile strength, flexural strength, impact resistance, percentage elongation,
- 6.2 Griffin theory, tear test, fatigue and wear, hardness, compressive strength time dependant properties like creep, stress, relaxation, etc.

UNIT-7 ENVIRONMENTAL RESISTANCE

- 7.1 Stress cracking, effect of weathering,
- 7.2 Biological degradation, fire, radiation staining.

UNIT-8 OPTICAL PROPERTIES

- 8.1 Refractive index, gloss,
- 8.2 colour matching, haze

UNIT-9 FIRE TEST

9.1 Ignition of flame and spread,

9.2 limiting oxygen index, rate of heat release, smoke toxicity test

UNIT-10 ADHESION TEST

10.1 Peel test, tension test, shear test.

UNIT-11 MICROSCOPY

10.1 Scanning electron microscopy, travelling electron microscope.

UNIT-12 IDENTIFICATION OF POLYMERS USING CHEMICAL METHODS

Reference Book:

1. Handbook of Plastics Analysis, H. Lobo and J. V. Bonilla, Marcel Dekker, 2003.
2. Handbook of polymer Testing Roger Brown, Marcel Dekker Inc, 1999.
3. Instrumental Methods by Dyer.
4. Developments in Polymer Characterization 1-5 by J. V. Dawkins

