

AMPL18 POLYMER RHEOLOGY

UNIT-1 STATE OF AGGREGATION

- 3.7 State of Aggregation and phase states of matter
- 3.8 Molecular motion in Polymers
- 3.9 Transition relaxation processes in Polymers.

UNIT-2 GLASS TRANSITION

- 2.1 Glass Transition,
- 2.2 Theories to determine the glass transition i.e. Dilatometric,
- 2.3 Heat capacity, measurement,
- 2.4 Thermomechanical,
- 2.5 Measurement of modulus of elasticity,
- 2.6 Effect of T_g on molecular mass,
- 2.7 Kinetic chain flexibility and chemical constituent,
- 2.8 Importance of T_g and T_m, HDT.

UNIT-3 VISCOELASTIC

- 3.1 Viscoelastic behavior of Polymer solution and melts stress-strain curves for Polymers,
- 3.2 Creep of Polymeric material,
- 3.3 Elastic deformation, and irrecoverable follow deformation.
- 3.4 Rubber like deformation,
- 3.5 Time-temp superposition (WLF Equation)
- 3.6 Models of viscoelasticity such as Maxwell and Kelvin model.
- 3.7 Types of viscosity, stress relaxation.

UNIT-4 INTRODUCTION AND BASIC CONCEPT OF RHEOLOGY

- 4.1 Classification of fluids,
- 4.2 Newtonian and non-Newtonian fluids,
- 4.3 Shear stress, shear strain and shear rate,
- 4.4 Shear modulus, bulk modulus, Zero shear viscosity,
- 4.5 Dependence of viscosity with temp, shear stress,
- 4.6 Shear rate fluid through channel,
- 4.7 Characteristic parameter during shear deformation.

UNIT-5 METHODS TO DETERMINE SHEAR VISCOSITY BY CAPILLARY RHEOMETER

- 5.1 Cone and plate viscometer, Cup and bob viscometer,
- 5.2 Measurement of normal stresses.
- 5.3 Theories of viscosities of dilute (Debye-Bueche theory) and conc.
- 5.4 Solutions (Grassie's entanglement theory), (Entanglement concern)

UNIT-6 RHEOLOGY OF DILUTE AND CONCENTRATED SUSPENSIONS,

- 6.1 Effect of Rheology during Injection, moulding Extusion:
- 6.2 Film extrusion, sheet Extrusion and
- 6.3 Blow mouldings of polymers. Rheometer,
- 6.4 Bubble inflation rheometer,
- 6.5 Compressional rheometers, stress relaxation instruments.
- 6.6 Torque rheometers, rotational & sliding surface rheometers and their use in determining process ability.

Reference books:

1. P.N.Cogswell, Polymer Melt Rheology, A guide for Industrial Practice, George Godwin
2. Richard C. Progelhof and James L. Throne, Polymer Engineering Principles, Hanser Publishers, New York, 1993.
3. John M. Dealy and Kurt F. Wissburn, Melt rheology and its role in plastics processing, Chapman, London, 1995.
4. R.S. Lenk, Polymer Rheology, Applied Science, London, 1978.
5. J.D. Ferry, Viscoelastic Properties of Polymers, John Wiley & Sons, New York, 1986.

