

AMPTE14 POLYMER RHEOLOGY

UNIT-1 STATE OF AGGREGATION AND PHASE STATES OF MATTER

1.1 Molecular motion in Polymers Transition relaxation processes in Polymers.

UNIT-2 GLASS TRANSITION

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

UNIT-3 VISCOELASTIC BEHAVIOR OF POLYMER SOLUTION AND MELTS STRESS-STRAIN CURVES FOR POLYMERS,

- 3.1 Creep of Polymeric material, elastic deformation, irrecoverable follow deformation.
- 3.2 Rubber like deformation, Time-temp superposition (WLF Equation) Models of viscoelasticity such as Maxwell and kelvin model.
- 3.3 Types of viscosity, stress relaxation.

UNIT-4 INTRODUCTION AND BASIC CONCEPT OF RHEOLOGY

- 4.1 Classification of fluids, Newtonian and non-Newtonian fluids, shear stress, shear strain and shear rate, shear modulus, bulk modulus, Zero shear viscosity,
- 4.2 Dependence of viscosity with temp, shear stress, shear rate fluid through channel,
- 4.3 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, Measurement of normal stresses.
- 5.2 Theories of viscosities of dilute (Debye-Bueche theory) and conc.
- 5.3 Solutions (Grassie's entanglement theory), (Entanglement concern)

UNIT-6 RHEOLOGY OF DILUTE AND CONCENTRATED SUSPENSIONS

- 6.1 Effect of Rheology during Injection, moulding Extrusion: Film extrusion, sheet Extrusion and Blow mouldings of polymers.
- 6.2 Rheometer, Bubble inflation rheometer, compressional rheometers, stress relaxation instruments. Torque rheometers, rotational & sliding surface rheometers and their use in determining processability.

References 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.