

PPE6J004 POLYMER REACTION ENGINEERING

Module I

Elements of Chemical Reaction Engineering: Introduction to chemical kinetics. Representation of expression for reaction rate, Temperature dependent and concentration dependent. Interpretation of Batch Reactor data for various types of reactions taking place in constant volume and variable volume batch reactors.

Module II

Reactor design – performance equations for batch and flow reactors – design for single reactions – multiple reactions. Heat effects in reactors – conversions – equilibrium – non-ideal flow in reactors

Single Ideal Reactors: Batch, CSTR and Plug Flow Reactors. Reactor choices for single and multiple reactions Viz. Series and parallel reactions. Residence time distribution in non-ideal flow reactors.

Module III

Heterogeneous reacting systems – models for reaction controlled – diffusion controlled mechanisms – application to design – solid catalyzed reactions – experimental methods for rates – application to design.

Polymerization reactors – by free radical mechanism – characterization of mixtures of polymers – mechanism – rate equations – design of reactors for free radical polymerization – stepwise addition and condensation polymerization and copolymerization – analysis of rate equation – polymerization in batch reactors – flow reactors.

Reference Books

1. J.M. Smith, *Chemical Engineering Kinetics*, McGraw-Hill, 1975.
2. H. Scott Fogler, *Elements of chemical reaction engineering*, PHI, 1992.
3. M.Kh. Karapetyants, *Chemical Thermodynamics*, Mir Publications, USSR, 1978.
4. G.N.Pandy, J.C.Chaudari, *Chemical Engg. Thermodynamics –Khanna Publishers*.
5. L.H.Sperling, *Introduction to Physical polymer science*, John Wiley & Sons. London.
6. Octave Levenspiel, *Chemical Reaction Engineering*, Wiley Eastern Ltd.
7. C.D. Holland & G. Rayboard Anthony, *Fundamentals of chemical reaction Engineering*.
8. Asua; Jose M, (Ed), *Polymer Reaction Engineering*, Blackwell Publishing, Ltd, Oxford
9. Gupta; Santosh Kumar and Kumar; Anil, *Reaction Engineering of Step Growth Polymerization*, Plenum Press, New York (1987).
10. McCrum; N. G., Buckley; C. P. and Bucknall; C. B., *Principles of Polymer Engineering*, Oxford University Press, Oxford (1988).[CN171]
11. McCrum; N. G., Buckley; C. P. and Bucknall; C. B., *Principles of Polymer Engineering*, Oxford Science Publications, Oxford University Press, Oxford (1995).
12. McCrum; N. G., Buckley; C.P. and Bucknall; C. B., *Solutions Manual- Principles of Polymer Engineering*, Oxford Science Publications, Oxford University Press, Oxford (89)
13. Meyer; Thierry and Keurentjes; Jos (Eds.), *Handbook of Polymer Reaction Engineering, Volume1*, Wiley-VCH, Weinheim (2005).
14. Meyer; Thierry and Keurentjes; Jos (Eds.), *Handbook of Polymer Reaction Engineering, Volume2*, Wiley-VCH, Weinheim (2005)