

C402: Chemical Rate Processes

Kinetic Measurements

General features of fast reactions; study of fast reactions by flow techniques, relaxation methods (T-Jump, P-Jump, ultrasonic, pulse radiolysis, NMR); flash photolysis; salt and solvent effects on reactions in solutions. (5)

Chain Reactions : Features of chain reactions; thermal and photochemical reactions (hydrogen-bromine reaction, decomposition of aldehydes and ketones). (5)

Kinetics of oscillatory reactions : Introduction to oscillatory reactions; Belousov-Zhabotinsky and Field-Koros-Noyes models. (4)

Rate Theory: Concept of potential energy surfaces, transition state theory including its statistical mechanical treatment, Phenomenological theories of unimolecular reactions (Lindemann, Hinshelwood), statistical mechanical theories of unimolecular reactions (RRKM). (10)

Reaction Dynamics: Collision theory and Reaction Dynamics, Reaction Cross section and rate constant, Brief idea of Molecular Beam Scattering, Dynamics in condensed phase. (10)

Femtochemistry : Concepts and perspectives; applications to studies of dynamics and control of chemical reactions. (6)

Recommended Books

1. Physical Chemistry, I. Levine, Tata McGraw Hill, 5th Edn., 2007.
2. Physical Chemistry : A Molecular Approach, D. A. McQuarrie and J. D. Simon, University Science Books, 1997.
3. Chemical Kinetics and Dynamics, J. I. Steinfeld, J. S. Francisco and W. L. Hase, Prentice Hall, 1999.
4. Chemical Dynamics in Condensed Phases: Relaxation, Transfer and Reactions in Condensed Molecular Systems, A. Nitzan, Oxford Univ. Press, 2006.

Reference Books

1. Basic Chemical Kinetics, H. Eyring, S. H. Lin and S. M. Lin, John Wiley & Sons, New York, 1980.
2. The World of Physical Chemistry, K. J. Laidler, Oxford University Press, 1993.