

Department of Chemical Sciences

Graduate Course on

Nuclear Magnetic Resonance

Course Content

Chapter 1 Basic Concepts

- 1.1 Nuclear spin and magnetic Moment
- 1.2 Nuclear spins in a magnetic field
- 1.3 Spin lattice relaxation
- 1.4 Spin temperature
- 1.5 Resonance absorption of energy and the NMR experiment
- 1.6 Kinetics of resonance absorption
- 1.7 Selection rules
- 1.8 Line widths
- 1.9 Bloch equations
- 1.10 More about relaxation

Chapter 2 High Resolution NMR spectra of Molecules

- 2.1 Introduction
- 2.2 Chemical shift
- 2.3 Spin-Spin coupling
- 2.4 Analysis of NMR spectra of molecules
- 2.5 Dynamic effects in NMR spectra

Chapter 3 Fourier Transform NMR

- 3.1 Problems in slow passage
- 3.2 Pulsed Excitation and Fourier Transformation
- 3.3 Apodization
- 3.4 Phases in FTNMR spectra
- 3.5 Solvent suppression
- 3.6 Pulse techniques for T_1 and T_2 measurements

Chapter 4 The Nuclear Overhauser Effect

- 4.1 Origin of the NOE
- 4.2 Experimental procedures
- 4.3 Transient NOE in multispin systems
- 4.4 Estimation of internuclear distances
- 4.5 Effects of internal motions

4.6 Cross correlation in NOE

Chapter 5 Multipulse Techniques

- 5.1 Spin system evolution
- 5.2 Product operator description of density matrix
- 5.3 Spin Echo
- 5.4 Heteronuclear Polarisation Transfer
- 5.5 Broad band decoupling, spin lock

Chapter 6 Multidimensional NMR

- 6.1 Segmentation of time axis
- 6.2 Two dimensional NMR
 - 6.2.1 General Scheme
 - 6.2.2 2D Fourier transformation
 - 6.2.3 Homonuclear J-Correlation
 - 6.2.4 Heteronuclear J-Correlation
 - 6.2.5 Multiple Quantum Correlation
 - 6.2.6 J, δ Separation
 - 6.2.7 NOE correlation
 - 6.2.8 Rotating Frame correlation
- 6.3 Three dimensional NMR
- 6.4 Four dimensional NMR

Chapter 7 NMR of Peptides and Proteins

- 7.1 Elements of protein structure
- 7.2 Resonance Assignments
- 7.3 Extraction of Structural Parameters
- 7.4 Calculation of Structures

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Venue: Lecture room AG-80

Days: Mondays and Thursdays

Time: 9:30 hr to 11:00 hr

The first lecture starts on January 16, 2017.