CHAPTER I

INTRODUCTION

Nuclear magnetic resonance spectrocopy or NMR is one of the best techniques which use to detect the energy difference between two energy states of nuclei which laying in the influence of applied magnetic field.

During the 1950's, proton nuclear magnetic resonance spectroscopy was introduced the first time by Purcell and Bloch to be one of the important physical methods for organic chemists and researches. The sensitivity of NMR spectroscopy was improved significantly in the late 1960's by signal accumulation, double resonance techniques, by the application of the principle of multichannel excitation, which resulted in the developement of pulsed and Fourier transform techniques[1]. With pulsed spectrometer, individual spectrum can be collected more rapidly so signal averaging become more efficient. Furthermore, the NMR spectrometers have been developed for many years for detecting not only a few nucleis with high natural abundance and high magnetic moment such as ^{1}H, ^{19}F and ^{31}P but included the less-receptive nucleis such as ^{13}C and ^{29}Si etc. At present the superconduct magnet has been used to develope in NMR spectrometers. These high feild magnets have dramatically improved the sensitivity and resolution so that made it possible to use to study more complicated chemical systems, physical, biological and medical sciences. The one of all adventages of NMR spectrometers is the maximum amont of useful information in the minimum amount of time and besides these, after

detecting the samples have not been destroyed or decomposed[2]. Because of the last adventage, it leads to the developement of new techniques come from the applications of NMR to solve the biological problems such as studying larger molecules, and observing the molecules in complex mixtures which constitute the living cells etc. These new techniques have been applied mainly to ^{1}H and ^{13}C NMR.

To date, nuclear magnetic resonance spectroscopy is one of the best methods for investigation conformation and dynamic stucture, particularly the structure elucidation of organic compounds.

Studying intramolecular and intermolecular effects by NMR spectroscopy enables us to understand the behavier of compounds in solution, for instance, solute-solvent interactions. The study of solute-solvent interactions have been directed at the understanding of the physical processes in which molecules arrange themselves relative to one another and how they move around in the liquids and the NMR techniques that often have been used are the relaxation times[3].

The mesurements of spin-lattice (T1) and spin-spin (T2) relaxation times of ^{1}H and ^{13}C atoms are proved to be useful techniques for determining both the rate of overall rotation of molecules as well as rate of intramolecular motions. The rotation of molecules in liquids has been studied for a number of years by magnetic resonance measurements. Nuclear magnetic resonance provides a convenient probe for the study of the rotation of molecule in liquids since the nuclear spin relaxation is dependent on the details of molecular motions, in particularly the information about rapid molecular motions can be obtained by T1 studies.

For chemists, there are two reasons why the relaxation processes (the general term for movements towards equilibrium) were interesting.

1. The relaxation parameters correlate with structure feathers of molecules, and particularly with their motions. Unfortunately, these correlations are not

understood in such a general sense as are those of chemical shifts and coupling constants, and relaxation measurements are sometimes use to good effects in structure elucidation.

2. It is necessary for consideration of relaxation processes in the design of NMR experiments such as quanitative analysis of some compounds.

The relaxation rates depend on such things as temperature, solution viscosity, molecular size and structure and in circumstances the applied magnetic field. In spite of these, a very common sources of accelerated relaxation is the present of paramagnetic substances, whose unpaired electron provide an effective stimulus for NMR transitions such as chromium (III), iron (III). There are many experiments in which mainly used proton relaxation times (T1 and T2) have been used to study the effects of many compounds to relaxation times and some were interested in the quantity of them but have not been interested in particularly dissolved oxygen. In this way this research is interested in the effects of dissolved oxygen which was the one of paramagnetic substances can influence on T1 and try to prediction the quantity of oxygen consumption in red blood cells (erythrocites) by using their informations which was proposed to be another application of NMR spectrometers.